255-6-32 A. N. Society.
Presented by S. L. Mitchell

THE

AMERICAN PRACTICAL LUNARIAN,

AND

SEAMAN'S GUIDE;

CONTAINING

1. An explanation of the principles by which the longitude is deduced from lunar observations.
2. On Lunar Observations.
3. On finding the longitude by Chronometer, and ascertaining its rate.
4. On the Sextant.
5. On the Thermometer—its use in navigation, particularly in the Gulf of Florida Stream.
6. On Natural Philosophy useful to seamen.
7. On the Marine and House Barometer, its use in predicting the weather.
8. On the Hygrometer.
9. On the causes of the errors of the Mariner's Compass.
10. On Magnetism.
11. On Electricity and the Lightning Chain and Rod.
12. Astronomy.
13. Sailing directions for the Madeiras, Canaries, Cape Verd Islands, crossing the Equator in the Atlantic Ocean, the Coast of Brazil, River Plate, Islands, Rocks, Shoals, Harbours, Roads, Anchorage, Latitudes, Longitudes, Winds, Currents in that route, drawn from late surveys.
14. Directions for sailing round Cape Horn, Valparaiso, and Lima.
15. Practical Seamanship.
16. Practical Sea Gunnery.
17. Stratagems for escaping from the enemy at sea.
18. Several sketches of trade not generally known; with a great variety of other useful information.

ILLUSTRATED WITH PLATES.

TO WHICH ARE ANNEXED,

A COMPENDIUM OF MARINE LAW,

AND

Mercantile Regulations and Customs;

BEING

A CORRECT AND USEFUL GUIDE TO ALL MEN IN BUSINESS, ESPECIALLY THOSE EMPLOYED IN THE COMMERCIAL LINE.

MARINE INSURANCE LAWS:

THE DUTY, AUTHORITY AND RESPONSIBILITY OF MASTERS OF VESSELS, AND THE LIABILITY OF OWNERS OF VESSELS FOR THE CONTRACTS OR MISCONDUCT OF THOSE THEY EMPLOY AS MASTERS.

COMMERCIAL FORMS.

BY THOMAS ARNOLD.

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ERRATA.

Page 318, line 13, for nine or ten inches, read *nine or ten feet.*

Page 54, line 5, for noon and midnight on the 6th, read *midnight on the 6th, and noon on the 7th.*

8·23·43

TO THE READER.

THE within work contains important information, on a great variety of subjects, interesting both to the merchant and mariner; being the result of forty years' experience of a seafaring life, during twenty-eight of which the author has been actively employed as master of vessels.

I have given rules and examples for working lunar observations, and for correcting the errors of the Sextant, illustrated by figures; also a short and easy method of clearing lunar distances from the effects of parallax and refraction, without any difference of cases, the correction being always applied the same way—invented by myself. On the Thermometer, its use in navigation, particularly in the neighbourhood of the Florida Stream, and on which it may be dangerous to rely on its indications. General remarks on the Gulf Stream, dictated by twenty-seven years diligence and experience of the author: an imperfect knowledge of the variations of this stream, has proved fatal to many. Various subjects on Natural Philosophy, useful to navigators, &c. The different subjects are found in the contents.

The safety of commerce depends much on the improvement of navigation, and at the same time contributes to increase the wealth of our merchants and the public revenue. When finding the latitude was in its infancy, great accuracy was required, and many years elapsed before the method of taking correct altitudes of the sun was generally established; only persons distinguished for their skill and perseverance could follow the examples of learned men, who first taught them the art: at present, sailors before the mast can take altitudes; and, it is hoped, in the space of a few years, they may be able to take distances. The keeping an exact reckoning, and being versed in the lunar observations, is of the first importance, the neglect of which not only affects the reputation of the mariner and the safety of the ship, but has caused the loss of many valuable lives and the ruin of numerous families. A proper experience in these matters should be the chief concern of those who undertake the navigation of a ship, whereby the lives and fortunes of

men are committed to their charge. By the knowledge of lunar observations, and a constant and careful practice of the same, and keeping an exact reckoning, they may not only bear the name of navigators, but likewise prove themselves worthy of the confidence reposed in them. Every commander navigating a vessel to foreign ports, should furnish himself with a good brass sextant, a Nautical Almanac, and the requisite tables given in the epitomes of navigation. These are all that are required for the purpose of finding the longitude: in the use of which, any one may be rendered expert by a little instruction and practice.

When the commander of a vessel can take a sextant, and measure the distance between the sun and moon, or moon and star, and in a few minutes ascertain his longitude within ten or fifteen miles, it must be pleasing to every mariner on board, as it not only prevents delay, but secures lives and property.

At the period of the first voyage to the East Indies, and for a long time afterwards, lunar observations were unknown; the consequence of which was the loss of several homeward bound ships on the coast of Africa; where the crews either perished, or were enslaved by the Hottentots and Cafres.

Several vessels which have never been heard of, there is little doubt have been lost on the Coast of Barbary, in consequence of the Gulf of Florida stream setting in a southeast direction on that coast, and thus deceiving the navigators in their reckoning. See Thermometrical Navigation, p. 105.

When running or clearing the British channel bound to the southward, in passing Cape Finisterre, precaution is necessary, as the current sets mostly to the eastward. A deplorable example of this was experienced by the British frigate Apollo, captain Dixon, with sixty-nine sail under convoy, bound to the West Indies. They sailed from Cork, March 26th, 1804, expecting that they had sufficient westing to clear every thing. At half past three in the morning, they struck on the coast of Portugal, in lat. 46° 22′ N. three leagues to the northward of Cape Mondigo, judging that their reckoning could not be much out in six days. Captain Dixon and sixty men perished in making exertions to reach the shore; forty sail of the convoy were wrecked, some of which sunk with all their crews, and almost every vessel lost from two to twelve men; so little is dead reckoning to be relied on. There was no chronometer on board the Apollo; a few sights obtained even with an indifferent chronometer, on the day preceding this fatal catastrophe, when the sun was visible, would have prevented this deplorable loss of lives and immense property.

I have calculated the logarithms five times, as given in this work, in the following manner:

Logarithm in table 1, is found by adding together the logarithmic sine of thirty degrees, the logarithmic cosine of the moon's apparent altitude, and the proportional logarithm of the correction of the moon's altitude, rejecting the tens in the indexes.

Logarithm in table 2, is found by adding together the logarithmic sine of thirty degrees, the logarithmic cosine of the star's apparent altitude, and the proportional logarithm of the correction of the star's altitude, rejecting the tens in the indexes.

Logarithm in table 3, is found by adding together the logarithmic sine of thirty degrees, the logarithmic cosine of the sun's apparent altitude, and the proportional logarithm of the correction of the sun's altitude, rejecting the tens in the indexes.

Table 4, contains the correction of the star's altitude, which is also his refraction.

Table 5, contains the correction of the sun's altitude, which is the sun's refraction in altitude less parallax.

Table 6, contains the correction of the moon's altitude, the method of calculating which I have given in page 7.

Besides calculating the above logarithms five times, as has been already mentioned, the proof sheets have been revised four times. I have run my ship by them for a number of years in manuscript.

The sailing directions I have copied principally from captain Horsburg's directions*; (edition of 1818, which is the latest and best extant), to which I have added some of my own remarks. I am indebted to captain John R. Butler, of the ship Thalia, of Philadelphia, for correcting a mistake in captain Haywood's directions of St. Mary's, at the entrance of the river Plate, for which see note in page 253 of this work.

I have copied the Marine Laws from an English edition of Steel. They contain many recent law cases on the subject of marine insurance, to which I have added some remarks of facts which came under my immediate notice, relative to marine insurance laws, &c.

* These Sailing Directions were drawn from late surveys, by officers of several British East India Company ships; also by order of the British government.

Directions for the Binder.

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Quarantine Laws.

EXPLANATION

OF THE

Principle on which the Longitude is obtained

BY

LUNAR OBSERVATIONS.

THE globe, which is 360° in circumference, revolves, on its axis from west to east, once in the course of twenty-four hours.* It is manifest that the meridian of every place on the earth will come opposite to the sun once in that time; and that whenever the meridian of any place comes opposite the sun, it is noon at that place, so that when the meridian of Greenwich comes opposite the sun, it will be noon at Greenwich, and a new day will commence. It must be further observed, that as the motion of the earth on its axis is uniform, equal parts of the equator will pass by the sun in equal spaces of time; and consequently, the one twenty-fourth part of it, or fifteen degrees, will pass by the sun in an hour. Hence, at the end of one hour, after the time when it was noon at Greenwich, the meridian, which is fifteen degrees west of the meridian of Greenwich, will come opposite the sun, and make noon to all places which are on that meridian; and a new day will commence at all those places exactly one hour after it commenced at Greenwich. In like manner, two hours after the time, when it was noon at Greenwich, the sun will arrive

* That is, the time from the sun's being on the meridian of any place, to the time of its returning to the same meridian the next day. But the earth performs a complete revolution on its axis in twenty-three hours fifty-six minutes and four seconds. This last is called the siderial day, which is the interval of time from the passage of a fixed star over the meridian of any place, till it returns to it again.

at the meridian, which is thirty degrees west of the meridian of Greenwich; and make noon at all places that are on that meridian, and a new day will commence at all those places on it, when it is two o'clock in the afternoon at Greenwich. The same reasoning will hold good for places which are still further west; and it is therefore evident, that the difference of longitude between any two places, bears the same proportion to the difference between the times at these two places, that fifteen degrees bear to an hour of time; consequently, if the difference between the times at two places be turned into degrees, minutes, &c. at the rate of fifteen degrees to an hour, one degree to four minutes, and one mile to four seconds, a half mile to two seconds, and a quarter of a mile to one second, it will be the difference of longitude between those two places: and it is further manifest, that if the time at the meridian of Greenwich be greater than the time at ship or place, the ship or place is to the westward of Greenwich; but if the time at ship or place be greater than the time at Greenwich, the ship or place is to the eastward of Greenwich; because the sun must have been on the meridian of the ship or place earlier than at Greenwich, and it was noon there before it was noon at Greenwich; and of course the day at ship or place commenced first, as the earth revolves from west to east, as has been already mentioned; this gives the sun an apparent motion from east to west. Hence it appears, that to find the longitude of any place, from another given one, as Greenwich, we must find the time of the day at each place: take the difference between these two times, and turn it into degrees and minutes, by allowing fifteen degrees for every hour, one degree for every four minutes; and one mile for every four seconds of time. The time at ship may be found from an observation of the sun's altitude, in the day time, or from an altitude of a known fixed star in the night, by rules which are given in the Epitomes of Navigation. For finding the time at the first meridian when at sea, many methods have been proposed; but two only have been found to perform it with reasonable accuracy; one is by observing the distance of the moon from the sun or fixed star, and the other is by means of a time-keeper.

The angular distance between the moon and sun, or moon and star, alters at about an average of twelve degrees in the twenty-four hours. It is manifest that the distance of the moon from the sun or star, cannot, under any other meridian, at noon, or any other time, there immediately deduced from observation, be the same as at noon; or the same time deduced from observation at Greenwich.

Suppose any distance of the moon from the sun or star, at any hour, under the meridian of Greenwich, say at noon; when it is noon in longitude ninety degrees west, it will be six hours

past noon at Greenwich; and the moon will have moved three degrees either further from, or nearer to the sun or star, according as the angular distance is increasing or decreasing; therefore, supposing the moon's daily motion to be just twelve degrees, it will be by proportion as twelve degrees motion of the moon is to twenty-four hours, so is three degrees to six hours; the difference of time between the two meridians, which, turned into degrees, make ninety west longitude; but when it was noon ninety degrees in east longitude, it wanted six hours of noon at Greenwich. The moon's distance from the sun, and such stars as are given in the Nautical Almanac, are in that work calculated as near the truth as possible, by the best tables, to every three hours, for the meridian of Greenwich; and by proportions, the distance may be found to any minute; consequently, if their distance under any other meridian is exactly determined, the longitude of the place may be found nearly. The greatest obstacle of this method of determining the longitude at sea, is, the difficulty of clearing the observed distance from the effect parallax and refraction; by these are many methods for clearing the observed distance from the effects of parallax and refraction. That which is given in this work is short and easy; it is of my own invention, and I have made use of it, in manuscript, during many years, at sea.

Formerly the longitude was reckoned from the island of Faro, the most westward of the Canary Islands; because it was the most westwardly land that was known when that practice was adopted; and the longitude was reckoned wholly eastward up to three hundred and sixty degrees. The Dutch, and Germans, and some others, still reckon their longitude in this manner from the meridian of the Peake of Teneriffe.

'The Spaniards, in sailing westwardly by Cape Horn, when they discovered the Philippine Islands, lost the greater part of twenty-four hours. In consequence of this, some of the inhabitants of Manilla, in the island of Laconia, keep Monday, believing it to be Sunday, to this day.

The following figure is a representation of the earth, on which are marked off the degrees and miles corresponding to the hours and minutes.

On it is also represented a ship sailing round the globe on the equator or any parallel of latitude; as every parallel is equally divided into three hundred and sixty degrees, which is the circumference of the earth.

Starting eastward from the meridian of Greenwich, and sailing one hundred and eighty degrees (no land being supposed to intercept her course) she has performed one half the circumference of the globe, and finds herself again on the meridian of Greenwich. Passing that meridian, she changes her longitude

from east to west; and the longitude is continually decreasing, until she again arrives at the meridian of Greenwich, or her starting point.

In sailing eastward, therefore, and performing the circumference of the earth, it is evident that for every fifteen degrees she sails, the sun will appear to her on the meridian one hour sooner than at Greenwich; consequently the ship as represented at one hundred and eighty degrees, has gained twelve hours, or it will be noon with her when it is midnight at Greenwich. It follows of course, that, having gone completely around the globe; in other words, arrived at Greenwich; she has gained one day; so that if she arrived on Sunday, it would be Monday by ship account.

The contrary takes place when sailing westward; as represented (Plate I. fig. 1. and 2.) In performing three hundred and sixty degrees she loses one day; or, arriving on Sunday, it will be Saturday by ship account.

If two ships start from the meridian of Greenwich, and one sail east, the other west, until they both meet on the meridian of Greenwich, having both sailed completely round the globe; they will differ two days in their account.

On the Revolution of the Moon round the Earth.

THE moon makes her revolution round the earth in twenty-nine days, twelve hours, forty-four minutes, and three seconds;* that is from new moon to new moon; and in that three hundred and sixty degrees being performed, it will average about twelve degrees in twenty-four hours, about half a degree per hour, or two miles in four minutes, which four minutes agrees with one degree of longitude, and two seconds of distance will make one mile of longitude.

As the moon revolves round the earth, and follows the earth round the sun, at the new moon she is between the sun and the earth; the side, therefore, next us is in total darkness; except the light reflected on her from the earth, which we cannot perceive. As she becomes more enlightened, the angle she

* The sun advances almost one degree in the ecliptic in twenty-four hours the same way the moon moves, therefore the moon, by advancing thirteen degrees and one-sixth in that time, goes little more than twelve degrees from the sun in twenty-four hours. Were it not for this correspondent motion, the moon would make her revolution round the earth in about twenty-seven days and eight honrs, as her revolution in her orbit is made from a fixed star to the same star again in twenty-seven days and eight hours.

makes with the sun will be the observed distance, which you get on the sextant in measuring the distance. As she advances eastwardly, the surface towards the earth becomes enlightened; and when she is ninety degrees east of the sun, which will be about seven and a quarter days, she will come to the meridian about six o'clock in the evening, having the appearance of a bright semi-circle. As she advances still to the eastward, she becomes more enlightened, and, in about fourteen days and a half, she will be on the meridian at midnight; being diametrically opposite to the sun, and will appear a complete circle, or it is said to be full moon. The earth is now between the sun and moon, and that half of her surface which is constantly turned towards the earth, is wholly illuminated by the direct rays of the sun; whilst that half which is never seen from the earth is involved in complete darkness.

The reason why one side is constantly turned towards the earth is because she revolves on her own axis in the same time that she performs her revolution round the earth.

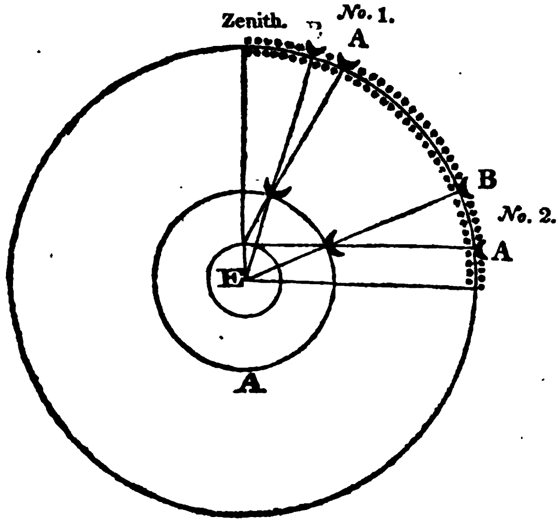
The moon, continuing her progress eastwardly, becomes deficient in her western edge; and about seven days and eight hours from the full she is again ninety degrees from the sun, and appears a semi-circle, with the convex side to the sun. Moving still eastwardly, the deficiency of her western edge becomes still greater; and then her convex or round side is turned to the east, and her horns towards the west; and in fourteen days and a half from the full moon she has again overtaken the sun. This period being twenty-nine days and a half, or a little more, the convex or well defined side is always turned towards the sun, and the horns of the moon will appear to the east or left hand of the spectator. This happens in north latitude from the new to the full moon; and the convex edge will appear to the east, from the full moon to the new, and her irregular side to the west or right hand. In south latitude the contrary takes place. By paying attention to the above, you will know what side of the moon to bring the star in contact with; as when she is nearly full it appears dubious which is her defined edge: but this, however, is a sure criterion.

The moon is subject to a small variation called the libration of the moon; so that she sometimes turns a little more of her one side or face toward the earth, and sometimes a little more of the other.

On Parallax.

AS beginners will require an explanation of the parallax, I have endeavoured to elucidate its meaning as much as possible, by plate II. figure 1.

PLATE II. Fig. 1.



E The earth. A The moon's orbit.

It is necessary to premise that astronomers take their calculations from the centre of the earth; so that it is evident that the parallax must be allowed on those calculations where it is required. Then

Suppose a spectator at the centre of the earth, will see the moon in her true place, whilst to a spectator on the surface she will always appear lower. The moon appearing among the stars, although she is nearer by an immense distance; the spectator on the surface will see her at A (plate II. fig. 1.) whilst the one supposed at the centre will see her at B. (plate II. No. 1.) The difference between A and B, No. 1, is the moon's parallax in altitude, and the difference between A and B, No. 2, is her horizontal parallax.

The moon's parallax is greater when she is in the horizon, and decreases until she reaches the zenith, where she has no parallax, and then the spectator on the surface will see her in a direct line with the one at the centre.

As the parallax always makes the objects appear lower, and the refraction makes them appear higher than they really are, it follows that to obtain the true altitude of the moon, the refrac-

tion being first subtracted from the parallax, the remainder is the correction of the moon's altitude; which being added to the apparent altitude, gives the true altitude of the moon.

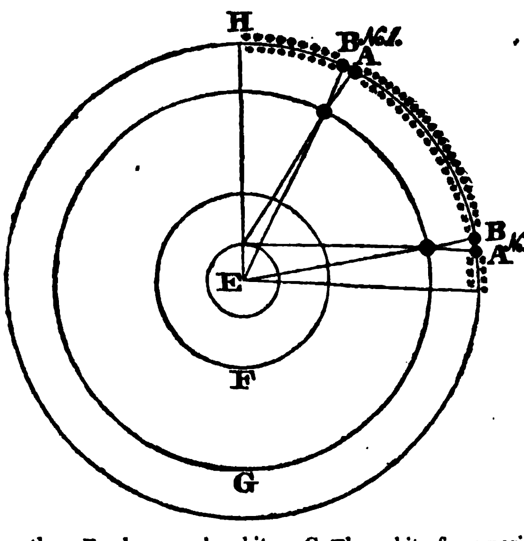
If the moon had no parallax, like the stars; her refraction would be her correction. As the greater the distance from the earth the less the parallax, the sun's parallax is very small; his greatest, that is when in the horizon, being only nine seconds; and his refraction greater, the difference between the refraction and parallax will be the correction of the sun's altitude.

The moon's horizontal parallax is given in the VII page of the month of the Nautical Almanac, for every noon and midnight, and may be proportioned to any time as before mentioned.

The moon's parallax in altitude may be found by increasing the index of the proportional logarithm of the horizontal parallax by 10, and subtracting the co-sine of the moon's altitude; the remainder is the proportional logarithm of the parallax in altitude, or the sine of the moon's zenith distance taken from the same proportional logarithm will give the proportional logarithm of the moon's parallax in altitude; and the refraction in altitude of the moon, taken from her parallax in altitude, will be her correction. Or by adding the proportional logarithm of the moon's horizontal parallax to the secant of her apparent altitude, the sum, rejecting the indexes, will give the proportional logarithm of the moon's parallax in altitude; the refraction being substracted from this will, as before, give the moon's correction.

PLATE III. Fig. 1.

Zenith.



E The earth. F he moon's orbit. G The orbit of a superior planet.

Plate III. is the same as plate II. but, to prevent confusion, it is to show that the further the planet is from the earth, the less the parallax. Here the moon's parallax is omitted.

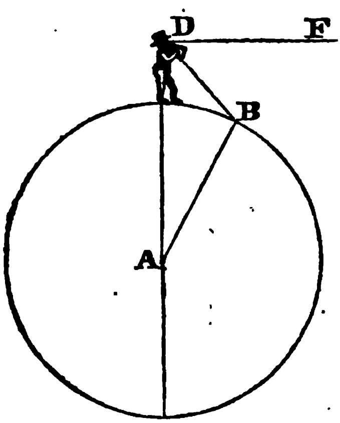
The greatest parallax of the moon is when she is in her perigee or opposition; that is when she is in that part of her orbit nearest the earth, and at the full; her least parallax is when she is in her apogee or conjunction; or when she is in that part of her orbit which is furthest from the earth, and at the change.

In the Nautical Almanac the horizontal parallax is given generally from 53 to 62 minutes.

On the Dip or Depression of the Horizon at Sea.

THE depression of the horizon at sea, or as it is commonly called, the dip, is the angle contained between the horizon of the observer and the furthest visible point on the surface.

Fig. 2.



For if an observer, whose eye is situated at D fig. 2, takes the altitude of a celestial object by a quadrant, and brings the object to the surface of the water B, instead of the horizon F, he evidently makes the altitude too great by the angle FDB.

Sensible or Visible Horizon.

THE sensible or visible horizon is that circle which terminates our view all round, of which we are the centre, and where, in a clear day, the sea and sky seem to meet.

The rational or true horizon is an imaginary plane passing through the centre of the earth parallel to the sensible horizon.

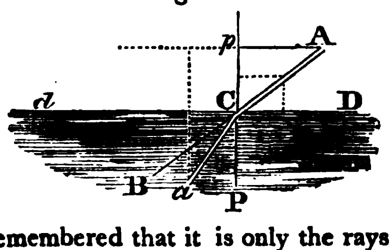
The sensible horizon extends only a few miles. For example:—if a man of six feet high were to stand on the surface of

the sea, the utmost extent of his view of the water would be about three miles; so that from the deck of a common sized ship, where the eye is from twelve to twenty feet above the level of the sea, the regular dip will be about four miles, and the horizon distant about six miles. It may be important to know, that at the distance of six miles from the land the fore observation of the sun's meridian altitude will answer, as the horizon will not be affected by the land. I have myself, when passing small islands at six miles distance, found no difference between the same meridian altitude in the openings between the islands, as when the land was between me and the sun; from which it is plain the horizon was not more than six miles distant, and the observation good.

On the Refraction of the Heavenly Bodies.

THE rays of light from a heavenly body, in passing to a spectator on our earth, come into the atmosphere, which, being a dense medium, bends them out of their course, and shows the body from whence they proceed more elevated than it really is. This will be rendered familiar to any one, by putting a piece of money in the bottom of a bowl or basin, and retiring back from it till it just disappears; then, without moving the money, pour the basin full of water, and the money will be seen clearly by the refraction, which the denser medium (water) will cause to take place.

Fig. 12.



It must be remembered that it is only the rays which fall obliquely that are thus refracted; for a ray which falls perpendicularly is equally attracted on all sides, and therefore suffers no refraction at all.

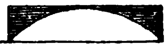
To illustrate this by the experiments which has just been mentioned, you must know that it is by the light reflected from it to your eye, that any object is rendered visible; you see the piece of money in the basin, therefore, by the rays of light which are reflected from its surface. Now the angle of incidence, and the angle of reflection, are equal, and as you stand in

an oblique direction to the piece of money, you see it while the basin is empty, by the rays of light which fall upon it in a direction exactly as oblique as that in which your eye is situated towards it. The piece of money then, which before was hid from your sight, is rendered visible by pouring in the water, because the rays of light, which serve to render it then visible, are bent out of their course. Thus the ray of light A C, fig. 12, which passes obliquely from the air into water at C, instead of continuing its course to B, takes the direction C *a*; and consequently an object at *a*, would be rendered visible by rays proceeding in that direction, when they would not have touched it, had they proceeded in their direct course.

By this figure you will understand that the angle of refraction P C *a*, is not so large as the angle of incidence *p* C A, but bears a certain proportion to it, and this proportion varies with respect to different mediums. Thus when a ray of light passes from air into water, the angle of incidence is to that of refraction in the ratio of four to three; from air into glass, as three to two; from air into diamond, as five is to two, and the contrary proportion holds good in passing back again, as when light passes from water into air, the ratio was three to four, and from all this you will clearly understand the more oblique a ray falls, the greater is the refraction. It is also necessary to remember that the light is refracted or drawn towards the perpendicular as in fig. 12, it passes out of rare into a denser medium, and it is refracted from the perpendicular, or in a more oblique direction, when it passes from a dense medium into one which is rare; and the denser the medium, the greater is the refraction; thus a diamond is found to refract most powerfully. This principle will explain several of the common phenomena of nature. Mr. Walker observes, that many a school boy has lost his life, by supposing the bottom of a clear river to be within his depth, as (when he stands on the bank) the bottom will appear one-fourth nearer the surface than it really is; a skilful marksman, who shoots a fish in the water, will take his aim somewhat below the fish as it appears, (perhaps a foot) because it appears much nearer the top of the water than it really is. But the most excellent use to which this principle has been applied, is the construction of optical glasses; for by grinding these glasses thinner at the edges than in the middle, those rays of light which would strike upon it in a straight line, or perpendicularly if it was plain, would strike upon it obliquely, and consequently suffer a refraction, and be made to converge: and on the contrary, by making the glass thinner in the middle than at the sides, the rays are refracted the contrary way, and are made to diverge: the former are called convex glasses, the latter concave. See fig. 13 and 14.

N. B. To converge the rays of light, is to cause them to meet in a point, after passing through the convex glass; and to diverge them, is the contrary.

Fig. 13. Fig. 14.

Convex. Concave.

In working for the apparent time to be used for lunar observations, the following table is not necessary, but it may be used in rating a chronometer which requires more exactness.

TABLE to correct the MEAN REFRACTION.

App. Alt.	Height of the Thermometer. 20°	28°	36°	44°	50°	56°	64°	72°	80°
° ′	add	add	add	add	″	sub	sub	sub	sub
3 0	71″	51″	32″	13″	0	13″	30″	46″	61″
3 30	64	46	29	12	0	12	27	41	55
4 0	58	41	26	11	0	10	24	37	50
4 30	53	38	24	10	0	9	22	34	45
5 0	48	35	22	9	0	9	20	31	40
5 30	45	32	20	9	0	8	19	29	38
6 0	41	30	19	8	0	7	17	26	35
6 30	38	28	17	7	0	7	15	24	33
7 0	36	26	16	7	0	6	14	23	31
7 30	34	25	16	7	0	6	14	22	29
8 0	32	23	15	6	0	5	13	20	27
8 30	30	22	14	6	0	5	12	19	26
9 0	28	20	13	5	0	5	11	18	24
10 0	26	18	12	5	0	4	10	16	22
11 0	23	17	11	5	0	4	9	15	20
12 0	21	15	10	4	0	4	9	13	18
Height of the Barometer.			30.7	30.1	29.6	29.2	28.6		

App. Alt.	Height of the Thermometer. 20°	28°	36°	44°	50°	56°	64°	72°	80°
0	add	add	add	add	″	sub	sub	sub	sub
14	18″	13″	8″	4″	0	3″	7″	11″	16″
16	16	12	7	3	0	3	6	10	14
18	14	10	6	3	0	2	6	9	12
20	13	9	6	2	0	2	5	8	11
22	11	8	5	2	0	2	5	7	10
24	10	7	5	2	0	2	4	6	9
26	9	7	4	2	0	2	4	6	8
28	9	6	4	2	0	1	3	5	7
30	8	6	4	2	0	1	3	5	7
35	7	5	3	1	0	1	3	4	6
40	6	4	3	1	0	1	2	3	5
50	4	3	2	1	0	1	2	2	3
60	3	2	1	1	0	0	1	2	2
70	2	1	1	0	0	0	1	1	1
80	1	1	0	0	0	0	0	1	1
90	0	0	0	0	0	0	0	0	0
Height of the Barometer.			30.7	30.1	29.6	20.2	28.6		

On the cause of the Sun and Moon's apparent Diameter varying.

The cause of the semi-diameter of both sun and moon varying are as follows:

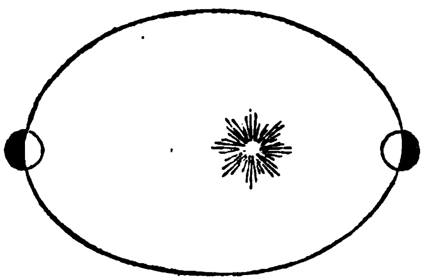
The orbit of the earth is an ellipse, and in whose foci is the sun; therefore in a year, or one revolution of the earth, it will be at its least and greatest distance from the sun.

The moon's semi-diameter varies considerably during its monthly revolution round the earth. The semi-diameter of the sun is set down in page third, of the month of the Nautical Almanac, is the greatest when nearest the earth, that is, when he is in his perihelion, and least when farthest from it, or in his aphelion. The moon's semi-diameter is effected by reason of her orbit being an ellipse, being greatest when she is in her perigee, or when nearest the earth; and least when in her apogee, or farthest from the earth. See plate V. fig. 1 and 2.

PLATE V. Fig. 1.

Orbit of the Earth.

Aphelion.

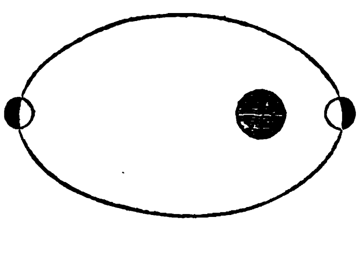


Perihelion.

Fig. 2.

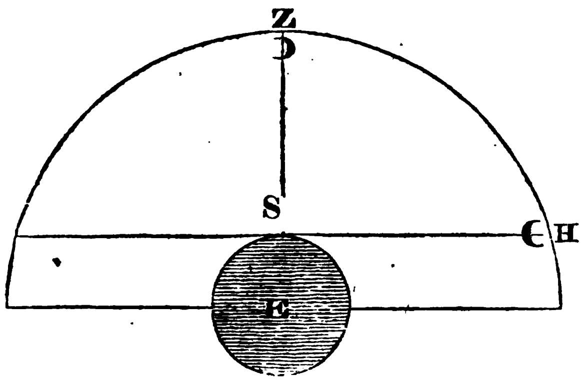
Orbit of the Moon.

Apogee.



Perigee.

PLATE VI. Fig. 3.



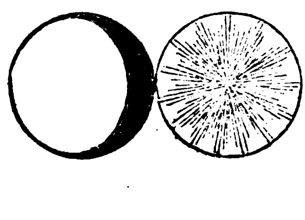
The moon has also an apparent augmentation as she approaches the zenith. In the Epitome of Navigation, called augmentation of the moon's semi-diameter, when she is in the zenith, she is a semi-diameter of the earth nearer the spectator, than when she is in the horizon. Let the arch H Z, plate VI. fig. 3. represent the track in which the moon rises from the horizon to the zenith; this arch being at an equal distance from the earth's centre E. A spectator placed at S, on the surface, will have the moon a semi-diameter of the earth nearer to him than when she is in the horizon, which will be perceived by measuring the distance from S to H, being a semi diameter of the earth greater than the distance from S to Z.

I shall now proceed to treat of the semi-diameters of the sun and moon, as used with the observed distances of the sun and moon, or of the moon and a star.

As the edges of the sun and moon cannot be made a fixed point for the determination of their apparent distance, on account of the augmentation, or increase and decrease of diameter; therefore the centres are considered to be brought in contact, by allowing the semi-diameters. The side of the moon nearest the sun being always enlightened by him, therefore the nearest limbs of the sun and moon are always taken in measuring the distance, and consequently, the semi-diameters of sun and moon are always additive.

Fig. 1. Fig. 2.

This will be better illustrated by the figures 1 and 2, Plate VI.



As the diameters of the sun and moon are not always the same, allowance has been made; and the semi-diameter of the moon, for noon and midnight, is given in the Nautical Almanac, page 7. By figures 1 and 2, it is plain that the centres of the sun and moon are not in contact by a semi-diameter of each; the semi-diameters therefore being added, they are reduced to their true centres.

The star, however, is sometimes on the defined side, and sometimes on the broken side; the moon's semi-diameter therefore is sometimes additive, and sometimes subtractive. Fig. 3, represents the nearest limbs of the star and moon in contact; here the moon's semi-diameter is additive. The star being small no semi-diameter is allowed on it.

Fig. 3.

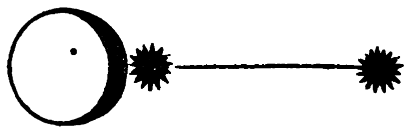


Fig. 4.

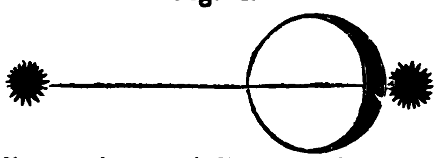


Fig. 4, shows the star taken from the broken side of the moon, and brought in contact with the round or defined side. There the distance is a semi-diameter of the moon too much, which of course must be subtracted.

Of the Index Error.

THE rules for adjusting the sextant are laid down in every Epitome of Navigation, I shall only add a few observations on the method of obtaining the index error with as much facility as possible, as, during my long practice at sea, I have had occasion to notice several young men, who thought they had learned the theory of lunar observations, but have nevertheless called on me to explain to them the method of getting the index error. I have, therefore, endeavoured, by the following method, to make it as plain as possible.

Set the index of the sextant at 0; screw in the telescope, and turn down the screens, to take off the glare of the sun; look at the sun through the telescope, and move the index forward until the edges of the direct and reflected images of the sun be in contact; then read off the miles and seconds. Move the index back until the contrary edges of the sun come in contact, and

read off the miles and seconds: half the difference of the two readings will be the index error.

If the sun's diameter should measure more on the arch than on the extra arch, it shows that the arch measures too much; the half difference therefore must be subtracted from the distance; but if the sun's diameter on the arch measures less than on the extra arch, the arch measures too little, and the half difference must be added to the observed distance.

If both the diameters should be taken on either the arch or the extra arch, the half sum will be the index error, and is additive, or subtractive accordingly.

We will suppose the index brought toward you, until the nonius on the index passes the first twenty miles on the extra arch, rather more than midway between twenty and forty; then observe on the arch where the miles cut; suppose at eight, and falling in between twenty and forty, I subtract eight from forty, leaving thirty-two miles on the extra arch; now, admitting that I have measured the diameter on the arch, and have found it to be 31′ 30″, the difference is 30″, and half is 15″, the index error, to be added to the observed distance, as the arch measures less than the extra arch. If the 0 on the index had fallen in between forty and sixty, the miles where they cut on the arch would be subtracted from sixty, &c. In place of subtracting eight from forty, if the index is marked up to twenty, you may begin at twenty and count to the right hand; by the time you have counted twelve, you will find them cut: add twelve to twenty, and you have the same result. Should they cut at any number, more or less, you must act accordingly.

Sextants are differently graduated: if each degree is cut into three, or into divisions of twenty miles on the arch, and each mile on the index into four, or fifteen seconds to each mile; because the degrees on the arch are each cut into three, or divisions of twenty miles, the index counts as high as twenty miles, and no higher. But suppose a sextant graduated thus; the degrees on the arch, cut into four, or divisions of fifteen miles each, the index marked up to fifteen, and cutting to fifteen; now, if the nonius on the index cuts somewhere between thirty and forty-five on the extra arch, beginning to count from fifteen toward the right hand on the arch, supposing it cuts at 13′ or 2′ from the fifteen to the right, you may either add 2′ to the 30″ or subtract thirteen from forty-five, the result will be the same; thirty-two to be used as before.

Some sextants have each degree divided into five, of twelve miles each, some into six of ten miles each, and the indices are regulated accordingly; the beginner must therefore be guided by the preceding precepts.

By the following figures I have endeavoured to represent the

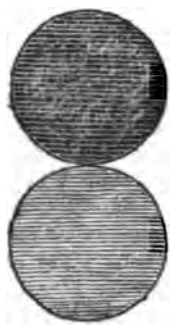
manner in which the direct and reflected images of the sun are brought in contact.

Suppose A, fig. 1. Plate VII. the direct image of the sun, at B; the reflected image in contact; which will count on the arch, say 31.30; then, by drawing the index toward you, bring the reflected image of the sun as at A, fig. 2, above the direct image B, and count, say thirty-two; then 31′.30″ subtracted from 32′ leaves 30″ and half is 15″ the index error, as before, additive to the distance, as the arch measures too little.

For the sake of distinction, we called what is read off on the arch, "*on*," and that on the extra arch, "*off*," thus,

PLATE VII. Fig. 1.

	*On	31.30
	Off	32.00
	Diff.	30
	Index error,	15 add.
Again.	On	33
	Off	31
	Diff.	2
	Index error,	1 subtract.



A

B

Fig. 2.

Again.	On	32′
	Off	31.30
	Diff.	30
	Index error,	15 subtract.
Again.	On	32′
	Off	32
		0 no index error.

A

B

And so on.

* The index error should always be found with the same telescope, that the distance is observed with. If in taking the index error, and by turning down different screens, the index error should differ materially, it shows that some or all the screens are defective; that is, the surfaces are not ground parallel to each other; this will occasion an error in the angular distance, and as soon as convenient should be taken out and good glasses put in their place.

PLATE VIII.

Fig. 3. Fig. 4. Fig. 5.

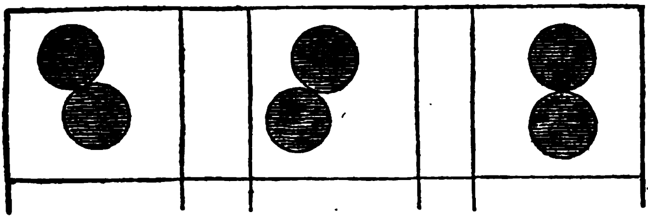
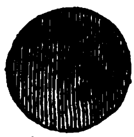


Fig. 6.



When the index is on nonius, and when the direct and reflected image of the sun are brought in contact in the inverted telescope, for the purpose of finding the index error, if they appear as in plate VIII. fig. 3 and 4, the instrument will want adjusting; but if they appear as in fig. 5, perhaps it will want no adjustment, or very little.

The index glass being set perpendicular to the plane of the sextant, if the index glass and horizon glass are not perpendicular to each other, the reflected image of the sun will appear on one or other of the sides of the direct image, when the index is at nonius, according to the deviation of the glasses, as is shown, Plate IX. fig. 1, 2, 3, and 4. Having therefore examined the index glass, as is directed in Epitomes of Navigation, set the index at 60°, or thereabouts, and look obliquely through the index glass towards the arch; if no notch appears in the arch between the direct and reflected arches, the index glass must be perpendicular to the plane of the sextant. It is most likely that the horizon glass will be thrown out of its perpendicularism, especially if it has an adjusting screw, which will sometimes give or come up a little. This will be discovered, as before mentioned, by seeing the reflected image of the sun on one side of the direct image.

If there be an adjusting screw on the back of the index glass, by looking directly through the telescope at the sun, the eye being screened, and moving the screw, you will discover which way it is to be turned, and make the images coincide. To effect this adjustment, set the index on nonius, turn down the screens, look through the telescope at the direct image of the sun; if you see but one image, round and well defined, the sextant wants no adjustment; if the direct or reflected image appear as before

mentioned, the index glass or the horizon glass, and perhaps both, are not perpendicular to the plane of the sextant, and the screw must be moved until but one image is perceived; this may also be performed by a screw placed on the back of the horizon glass. Some glasses have no adjusting screw, and in this case the error must be allowed, as a constant quantity.

PLATE IX.

Fig. 1. Fig. 2. Fig. 3. Fig. 4.

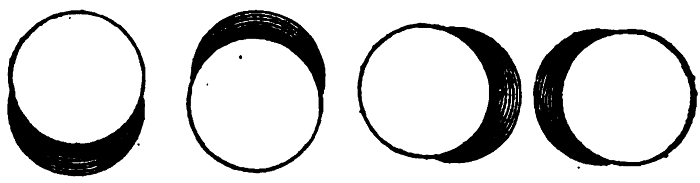
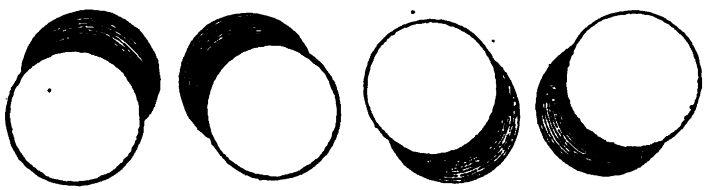


Fig. 5. Fig. 6. Fig. 7. Fig. 8.



The above figures will serve to explain the meaning of the perpendicularism and parallelism of the glasses.

* In fig. 1 and 2, the parallelism of the horizon glass is out of the way; and in fig. 3 and 4, the perpendicularism is not correct. Fig. 1. shows the reflected image of the sun below the direct image, having the same effect as if the index were pushed forward a little: it consequently measures too much, and the index error must be subtracted.

In fig. 2. the reflected image appears above the direct image, producing the same effect as if the index were pushed back a little; the index therefore measures too little, and the error will be additive.

Fig. 3 and 4, exhibits the perpendicularism of the horizon glass out of the way, and the sun's reflected image appears either on the right or left hand side of the direct image.

Figure 5, 6, 7 and 8, both the perpendicularity and parallelism of the horizon glass are not perfect, and the reflected image appears either above or below, and at either side of the direct image.

If the index glass be exactly adjusted, it will most likely hold its adjustment better than the horizon glass; and when the ho-

* This is when the index is set on nonius, that the figures, as in Plate IX, appear thus, if the adjustment of the instrument be out.

rizon glass is out of adjustment, making the sun appear as in fig. 1, 2, 3, 4, 5, 6, 7, 8, it will affect the observation; it will be well therefore to examine whether nothing be wrong, before you proceed to measure the distance;—it is presumed, also, that the telescope is parallel to the plane of the sextant, as before advised.

When there is no apparent index error, the sun will appear round and well defined, as in fig. 6, Plate VIII. yet, notwithstanding all the care that may be taken, and that the direct and reflected images may appear to coincide perfectly, yet, on account of the glare of the sun's rays, there may still exist some small index error, of several seconds, which it will be proper to obtain, as directed in Plate VII.

In measuring the distance with the above errors, you will bring the moon either a little to one side or the other of the sun, unless proper allowance is made; therefore, your observation will be erroneous. It is really astonishing to me that some, who imagine they understand the lunar method of getting the longitude, omit entirely the index error; and it must reasonably be supposed that they do not know whether the telescope is parallel to the plane of the instrument or not: this is certainly prejudicial to lunar observations; but when in good hands they are most excellent, and will come within a degree of exactness, which no one, unacquainted with the operation, would imagine.

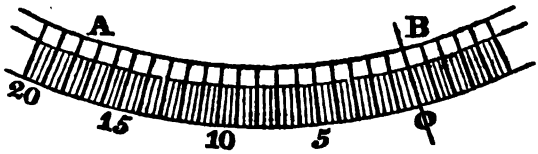
The colour of the images will depend on the colour of the screens turned down: thus a light red and a green will make the object appear yellow. In observing the direct and reflected images of the sun for the above purpose, it will be best to make as much distinction as possible between them, by means of the screens, that the error may be more easily perceptible; and when you use the screens, in taking the distance between the moon and a star, such screens must be turned down as will render the colour of the moon most distinct from the colour of the star; for if you have them nearly of the same colour, you will not be able so readily to distinguish when they are in contact.

It will be well if a card or stiff piece of paper, be put on the telescope, when getting the index error, to protect the eye from the sun's rays.

In the subsequent pages I recommend the use of the inverted telescope, and assign my reasons for it; but when the distance between the moon and a star is taken, which distance generally is not very great, and it being difficult to use the inverted telescope, the direct telescope may be substituted; but if it can be used it will be better than the direct telescope.

I have annexed part of an arch of a sextant merely to show the difference between the arch and the extra arch in Plate X.

PLATE X.



A Arch. B Extra arch.

Fig. 1.

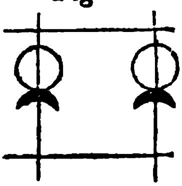


Fig. 2.

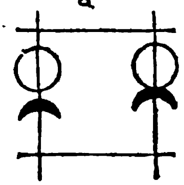
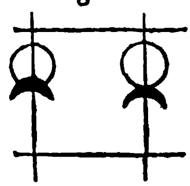


Fig. 3.



In setting the axis of the inverted telescope to the plane of the sextant, the axis of the telescope should be parallel to the plane of the sextant; as a deviation, in this respect, will occasion a considerable error in the observations, and is more sensible in large angles; to avoid which, a telescope is made use of with wires, as in Plate X. To make this adjustment, screw in the telescope, pull out the focus, turn the tube till the wires be parallel to the plane of the instrument; then take two objects, such as the sun and moon, or moon and star, where the angular distance must not be less than ninety degrees, because the error is more easily discovered in a great distance; bring the objects in contact at the wire which is nearest the plane of the instrument, as in fig. 1. Plate X.; then, by altering the position of the sextant a little, make the images appear on the other wire, as in fig. 1. If the contact remain perfect, as appears in fig. 1, the axis of the telescope is right; but if the limbs of the objects appear to separate at the wire that is farthest from the plane of the telescope, as at fig. 2, it shows that the object end of the telescope inclines towards the plane of the instrument; which must be rectified by tightening the screw nearest the sextant, having first slackened the screw farthest from it. If the images overlap each other at the wire farthest from the sextant, as in fig. 3, the object end of the telescope is inclined from the plane of the sextant; the contrary screw must therefore be tightened, the other being previously slackened. By repeating this operation a few times, the contact will be perfectly the same at both wires, and the axis of the telescope will be parallel to the plane of the instrument.

To save the trouble of referring to the Nautical Almanac for setting the index on the distance, it will be more convenient to bring the objects to lap a little; then screw in the telescope, and they will be found with ease in the field of the telescope.

Explanation of the Principles by which Lunar Distances are cleared from the Effects of Parallax and Refraction.

WITH a little reflection it will be conceived that neither parallax nor refraction can alter the angle ☽ZD, fig. 15: for the sun, whether seen at ☉ or at D, and the moon, whether seen at ☽ or T, in the heavens, will be in the same point of the compass, and affected only by their altitudes, which affects the distance.

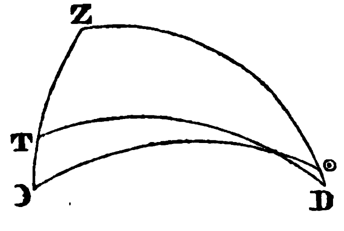
The apparent distance, the sun and moon's apparent zenith distance, together with the horizontal parallax, are given to find the true distance. The triangle ☾Z☉ corresponds to the apparent distance of the sun and moon, and their apparent zenith distances.

The apparent zenith distances, ☽Z and ☉Z, must now be corrected for parallax and refraction, to find their true zenith distance.

It has been already observed, that to a spectator on the surface, the moon's altitude appears more depressed, and the sun's altitude more elevated, than they really are. The correction of the moon's altitude, therefore, is always additive to her apparent altitude, and the sun's correction is always subtractive, as he is more elevated by refraction than depressed by parallax.

Here two cases of oblique spherical triangles must be computed, before the distance can be corrected, and the true distance found. To work by this method would be only perplexing; it is merely inserted to explain the principle on which the apparent distance of the sun and moon, or moon and star, is cleared of the effects of parallax and refraction. It will be seen, by fig. 15, that the line ☽☉ is the apparent distance, and TD the true distance.

Fig 15.



On Rating a Chronometer.

In rating a chronometer it is absolutely necessary to know whether or not it has altered its rate of going whilst under trial. If it should, all the observations must be rejected which were made before the alteration took place, retaining only those made afterwards. Should there be no material alteration in its rate, during the time of trial, take the difference between the time it was too fast or too slow, on the first day of observation, and what it was too fast or too slow on the last day, if they be the same: that is, both fast, or both slow. But add them together, if two fast in one instance, and too slow in the other. This sum or difference being divided by the number of days elapsed between the first and last observation, the quotient will be the numher of seconds and parts of seconds that it gains or loses per day. If the chronometer be faster at the end of the trial than at the beginning, of course its rate is gaining; but losing if it be slower.

Those who choose chronometers should be careful to observe that the minutes on the dial-plate be equally divided, otherwise it will be difficult to rate them. The second hand will vary when the minute hand comes to each minute; and it is most likely that such chronometers as are not equally divided on the dial-plate are good for nothing. It matters not whether the second hand be on the 60 at each minute, or not, provided it always be on the same second. I had a chronometer to rate by one of which the dial-plate was equally divided; and the method I pursued was to compare them each day, at the same hour and minute; but this could not be done when rating it by the sun's altitude.

The Uncertainty of finding a new Rate of a Chronometer on making Land by its known Longitude.

Some have asserted that whenever a ship touches at a port, or arrives off any headland or island, of which the longitude is known, a new rate of the time-keeper may be obtained. In order to warn persons against being misled by this mistaken idea, I invite attention to the following remarks.

Suppose a ship to sail from a port in the United States, bound to Canton. If she makes the island of St. Paul's in the Indian Ocean, in sixty days, when it is discovered that the longitude shown by time-keeper is thirty miles wrong, or that it has erred

two minutes in time, it is plain to every one, that if the time-keeper altered its rate immediately on leaving port, and continued to go uniformly afterwards, it must have altered its rate exactly two seconds a day. If it did not alter its rate till one-third of the time had elapsed, and went uniformly afterwards, it must have altered its rate three seconds a day. If it did not alter its rate till half the time was expired, it must have altered its rate four seconds a day. If not till two-thirds of the time were elapsed, it must have altered its rate six seconds a day; and if not till the day before the ship arrived off the island of St. Paul's, it must have altered its rate two minutes a day.

Now, if we conceive the time-keeper to have altered its rate gradually (which would be most probable) or admit the probability that it might have gone first faster, and afterwards slower, or first slower, and afterwards faster, than it was going at the commencement of the voyage, the quantity of a rate obtained as above could not be computed, as a due allowance could not be made for the variations of the time-keeper. I have proved the variations of several time keepers, which I have had under trial to rate. Some of them I have found to go uniformly for a time, and afterwards to change their rate suddenly. After their changes I commenced new trials. See example of rating a chronometer at Whampoa, on board the ship William Savary, of Philadelphia, in the following pages.

It has already been mentioned, that observations for rating a chronometer ought to be taken either uniformly in the forenoon or uniformly in the afternoon, because the refraction of the forenoon differs from that of the afternoon. The best time for taking these observations is when the sun bears as nearly as possible either due east or west; but not when it is less than eight or ten degrees high. But if observations should be made both morning and afternoon on each day, too much confidence must not be placed in them, made at those altitudes, if there should be any material difference between the heights of the thermometer, at the times of the morning's and afternoon's observations; and, indeed, observations taken at those altitudes, even if taken only in the morning, or in the afternoon of each day uniformly, if there should be any material difference in the heights of the thermometer at each time of observation, too much confidence cannot be placed in them so taken, as the difference of temperature of the atmosphere varies the refraction with low altitudes.

These remarks apply only to the rating of chronometers, as in that particular great precision is required.

The following will show the mode I took to rate a chronometer in 1819.

Rate of Baraud's Chronometer, No. 748. Liverpool, 1819.

Month.	Day.	Hour P. M.	Fast of Liverpool mean time.	Gained.	Lost
1819, June	6	5 1 44	0 0 46	0″	0″
	7	4 50 43	0 0 42	0	4
	8	3 32 51	0 0 39	0	3
	11	3 29 31	0 0 38	0	1
	12	4 1 18	0 0 41	3	0
	15	5 47 29	0 0 42	1	0
	18	4 12 0	0 0 46½	4½	0
	19	4 52 56	0 0 49	2½	0
	23	5 2 53	0 0 53	4	0
July	1	4 3 22	0 1 4	11	0
	4	4 2 30	0 1 1	0	3
	8	4 27 0	0 1 13	12	0
	9	4 32 0	0 1 10	0	3
	10	4 54 0	0 1 12	2	0
	14	5 29 56	0 1 14	2	0
	16	5 15 57	0 1 6	0	8
	17	4 37 35	0 1 15¼	9¼	0
	22	4 20 8	0 1 16¾	1½	0
	24	4 38 15	0 1 12	0	4¾
			Gain,	52¾	26¾
			Loss, subtract,	26¾	
			Nett gain,	26¼	

Gaining a little more than two seconds per day from 24th July 1819.

In the foregoing example all the gainings, and all the losings, during the forty-eight days, the chronometer was under trial, were added up separately, and the difference of the sums taken, which made its rate more than half a second gain per day.

EXAMPLE.

I took an altitude of the sun with the artificial horizon on the 24th July 1819, which was the last day of trial, by which I made the apparent time, $4^h\ 2'\ 22''$

Equation from Nautical Almanac, 24th July 1819,			6	7
Mean time at Liverpool, 24th July 1819,		4	8	32
Longitude of Liverpool, 2° 52′ W. in time,	add		11	28
Mean time at Greenwich,		4	20	00

Time at Greenwich,	subtract	4^h 20′ 00″
Time shown by chronometer,		8 46 49
Fast of Greenwich time, and constant error,		4 26 .49

The constant error is to be applied to the time by chronometer each time of observation, for finding the longitude by it, and in this case it is subtractive from the time shown by chronometer.

The following will show an example different from the former, being the mode I pursued to rate the same chronometer on board the ship William Savary, then lying at anchor at Whampoa.

Rate.	Hour A. M. apparent time.	Hour P. M. apparent time.	Slow of mean time.
1820, Jan. 1	0 0 0	3 10 38	7 47 43
18	9 8 56	0 0	7 48 42
22	9 21 12	0 0	7 48 58
23	9 10 52	0 0	7 48 57
Feb. 10	8 48 27	0 0	7 49 37
11	9 26 43	0 0	7 49 40
23	7 24 38	0 0	7 50 14
24	0 0 0	2 33 16	7 50 16
27	0 0 0	3 6 42	7 50 20
28	7 51 08	0 0	7 50 30
March 4	7 55 42	0 0	7 50 47
5	8 49 13	0 0	7 50 45
20	7 38 5	0 0	7 51 13

Finding from the foregoing that an alteration took place on the 27th of February, I commenced a new trial, from the 28th of that month until the 20th of March; which being twenty days, and the difference being nearly regular during that time, I subtracted what the chronometer was too slow on the 28th of February, from what it was too slow on the 20th of March, and divided the difference by twenty, the number of days elapsed.

On the 28th February it was slow of Whampoa mean time,	7^h 50′ 30″
On the 20th March it was slow of ditto	7 51 13
	43

The difference of forty-three seconds gives two seconds and one-tenth the chronometer loses.

To find the constant Error.

EXAMPLE.

Whampoa, March 20th, 1820, I took an altitude of the sun with the artificial horizon, which was the last day of trial, which made the apparent time, afternoon, 4^h 20′ 10″

Equation from Nautical Almanac, 20th March, add		7	41
Mean time at Whampoa,	4	27	51
add	12		
	16	27	51
Longitude of Whampoa 113.25 E. in time,	7	33	40
Mean time at Greenwich, by civil account, (and which is 20^h 44′ 11″ on the 19th, by astronomical account) is on the 20th A. M.	8	54	11
Time shown by chronometer,	8	36	39
Slow of Greenwich time, and constant error,		17	32

N. B. In this case I add twelve hours instead of twenty-four, as hereafter directed.

The Grand Ladrone, on the 8th of April, 1820, bearing due north, I observed the sun's altitude, which gave 3^h 19′ 2″ P. M. apparent time, the equation reduced to Greenwich time being 1′ 54″ additive.

Apparent time,				3^h	19′	2″
Equation,			add		1	54
				3	20	56
				12		
				15	20	56
Time per chronometer,		7^h 27′	50″			
Constant error,	add	17	32	7	46	00
Rate of losing, 19 days, at 2″ per day,	add		38			
Longitude in time,				7^h	34′	56″

Which gives the longitude by chronometer, east, 113° 44′ 00″

And the grand Ladrone being in 113.44, shows the constant error and rate to be correct.

To Rate a Chronometer by an Artificial Horizon.

THE artificial horizon is a vessel filled with quicksilver, tar, molasses, or water, by which an observation may be obtained on shore with a sextant, when the altitude is not more than sixty degrees; and with a quadrant, when the altitude is not more than forty-five degrees.

Remark.—The quadrant, in such case, must have screens fixed to let down before the horizon glass, to screen the eye from the sun's glare.

Find the sun's image in the artificial horizon, and bring the sun's image found by the instrument in contact with the image formed by the fluid, and you will obtain a double altitude. An artificial horizon has a floating glass, and a roof made of glass, to prevent the wind from disturbing the fluid. If tar, molasses, or water be used, without a screen, it must be put where the wind will not disturb it; and the molasses or tar must be first strained, to clear it of lumps. You must use half this angle shown on the arch of the instrument, and it must be corrected for semi-diameter, parallax, and refraction; but no dip must be allowed. If the nearest limbs are brought in contact, the semi-diameter must be added; but if the farthest limbs be brought in contact, the semi-diameter must be subtracted. Half the index error must be used, when observing by the artificial horizon.

Care should be taken that the glass covering the quicksilver does not adhere to the side of the vessel containing the quicksilver, which would throw it out of its horizontal position. The method I have adopted has been to level the dish, with a small quantity of quicksilver, by placing small pieces of paper under the lowest side. If this be first done, the floating glass will not adhere to the side, which will prevent error in the observation. I have used the roof formed of two plates of glass, the two sides of each being ground perfectly plain, and parallel to each other; but to prevent any bad effects, care must be taken to put the roof on the same way; that is, the same side towards the observer, every time he makes use of it, so that the observation be uniform.

To know if the glasses are ground parallel to each other, look obliquely at some image reflected in the glass, as the roof of a house, &c. and if the object be in one, that is, if it look of its natural shape, without any double, or other imperfect appearance, the glasses are parallel and good. In a very still time, the roof may be made use of, without the floating glass, which will prevent error from the above cause.

In rating a chronometer from the altitude of the sun, it ought to be done on the same side of the meridian; because the atmosphere in the morning is more dense than in the afternoon, the sun not having time to rarefy it; and of course the refraction in the morning will be greater than in the afternoon; so that if the altitude be sometimes observed in the forenoon, and at other times in the afternoon, they cannot be uniform. I have been at anchor at different places, when I found that my morning and afternoon observations made a difference of three, and sometimes four miles, in finding the longitude by the chronometer.* Now, if the sun should rise or fall at the rate of twelve miles in a minute, then, if there should be a difference of four miles in the altitude between the morning and afternoon, it will occasion a difference of one-third of a minute in time, and one-third of a minute will occasion an error of five miles in longitude, and more or less in proportion to the difference in the altitude. If possible, the altitude ought to be taken as near the same time each day, or when the altitudes are about the same, which will make the index fall on the same part of the arch nearly. This will obviate any imperfections in the graduation of the arch of the instrument. If possible the same screens or glasses ought to be used; as they may sometimes make a difference of one mile in the altitude; and if the sun alter in altitude at the rate of twelve miles in a minute, the error will be one-twelfth of a minute in time, which is five seconds in time. This is trifling in finding the longitude, but in rating chronometers, it is of consequence, and I have found the least haze to make a difference of several seconds in time, from a comparison with altitudes taken but a few minutes before or after, when the atmosphere was perfectly clear.

As the tangent screw of the sextant has a spring or elasticity, it is best to tighten it before the objects are quite in contact. This may prevent an error of a few seconds, either in the altitude taken by the artificial horizon, or when taking the distance. This is applicable when the distance and altitudes are decreasing: but if they be increasing, then the objects ought to be lapped a little; and the screw tightened. In both these cases wait till the objects come exactly in contact, and the observation will be made.

Suppose the instrument showed forty degrees, forty minutes, and twenty seconds altitude of the sun, at four hours fifty minutes P. M. on the 20th of April, 1817, in longitude seventy-five west of Greenwich, latitude forty degrees forty minutes

* This is when the altitude is not more than eight or ten degrees high.

*

north; the index error thirty seconds additive, the half of which, fifteen seconds, is to be added to the altitude.

	°	′	″		°	′	″
Double alt.	40	40	20	Sun's dec. April 20, 1817,	11	29	30
				Correction for 4h 50′ from			
Sun's obs. alt.	20	20	10	Table XVI. 20th April, add		4	13
Sun's semi-diam.		15	56	Cor. from same table, 20th			
				April for longitude 75 W. add		4	22
	20	36	06				
Sun's cor. T. V.		2	21	Sun's correct declination,	11	38	05
					90	00	00
	20	33	45				
Half index error			15	Polar distance,	78	21	55

Sun's cor. alt.	20	34	00		
Latitude,	40	40	00	Secant,	0.12004
Polar distance,	78	21	55	Co-secant,	0.00901
Sum,	139	35	55		
Half sum,	69	47	57	Co-sine,	9.53819
Sun's altitude,	20	34	00		
Remainder,	49	13	57	Sine,	9.87931
					19.54655

Half sum sine equal 36° 23′ 28″ H. angle, 9.77327
2

Hour angle, 72 46 56, which being reduced to time, at the rate of fifteen degrees to an hour; or, more briefly, by Table XIII, gives four hours, fifty-one minutes eight seconds, P.M.

Apparent time,	4h	51′	08″
Longitude 75 west in time,	5	0	0
Time at Greenwich,	9	51	8

Equation April 20th, 1817 for noon at Greenwich,	1′	6″.9
As 24h is to 9h 51′ so is 12″.5 (daily difference) add		5.2
Equation for longitude, 75 west,	1	12.1

Apparent time,	4h	51′	8″
Equation,		1	12
Mean time,	4	49	56

Time by chronometer when the observation was taken,	$4^h\ 49'\ 59''$
Mean time deduced from observation,	4 49 56′
Difference,	3

When the sun's altitude is observed in the forenoon the cosines of the four logarithms must be used in place of the sine as above.

The observation must be repeated every day, when the sun is clear. See examples for rating the chronometer in Liverpool and Whampoa in the preceding pages. The most proper time for making these observations is when the sun is nearly due east or west. The rate of the chronometer is obtained this way; but the absolute time is not given by it, nor how much the chronometer is too slow or too fast for mean time at the meridian of Greenwich. This must be found by observing the altitude of the sun immediately before the ship sails, by the horizon of the sea, or double altitudes with the artificial horizon, if the former be open towards the east or west at the place of observation.

Suppose off Cape Henlopen, seventy-five degrees west longitude, the mean time is found to be $4^h\ 20'\ 10''$

Longitude seventy-five west in time,	5
Mean time at Greenwich,	9 20 10
Time shown by Chronometer,	8 10 10
Chronometer slow of Greenwich time,	1 10 00

Which one hour ten minutes must be applied to the time by chronometer, when the observation is taken, as a constant error, in this case additive; but if it had been one hour ten minutes fast of Greenwich time, it would have been subtractive, and the daily rate must be allowed also.

Suppose in seventy-five degrees of east longitude,

Time at ship,	6^h afternoon.
Longitude seventy-five east in time,	5
Mean time at Greenwich,	1 subtract.
Time by Chronometer,	4
Chronometer too fast for Greenwich time,	3 const, err.

Suppose on the 20th May at 2 P. M. both by civil and astronomical time, longitude ninety degrees east.

Mean time at ship,	2^h
	add 24
	26
Longitude ninety degrees east in time	6
	20^h

Will be twenty hours the 19th of May at Greenwich, astronomical account, and also 8 A. M. on the 20th, civil account.

Mean time at Greenwich,	8^h
Time shown by chronometer,	6
Chronometer two hours too slow of Greenwich time,	2

Which is to be applied as a constant quantity to the time by chronometer.

Explanation of the difference between Mean and Apparent Time, to shew how one may be derived from the other.

APPARENT time is that which is derived immediately from the sun, either from observing its transit over the meridian, at the instant of apparent noon, or by observing its altitude at a distance from the meridian.

Mean time is that which is shewn by good clocks or watches properly regulated to go twenty-four hours.

As the earth revolves uniformly on its axis, if it had no annual motion in its orbit, or if that motion was uniform, and in a plane, parallel to the plane of the equinoctial, the natural days would be always of the same length, and the apparent and mean time would be the same. But this is not the case; and thus the time which elapses between the sun's being on the meridian of any place, and its return to it, is considerably longer at some times than it is at others.

The annual motion of the earth, is not perceived by us who are upon it, but it is the cause of an apparent motion in the sun, the same way, namely, eastward, and of the same quantity; consequently, when the earth, by its diurnal rotation on its axis, has brought any place on its surface, opposite to the point where the sun was the preceding noon, the inhabitants of that place will not find the sun there, but will have to follow it still further eastward, by a quantity equal to the sun's apparent diurnal motion in its orbit, before the place they inhabit will come opposite to it: and, as it has been observed, this motion is not only un-

equal in itself, but is rendered apparently more so, by the obliquity of its direction.

It is obvious that the earth will have to follow the sun sometimes a longer, and sometimes a shorter space, before the same points on its surface will come opposite to it, and of course the length of the natural days will be sometimes longer, and sometimes shorter. But as all good clocks and watches go uniformly, the mean day of twenty-four hours, which is shown by them, must necessarily be always the same length; it therefore follows, that when the sun's apparent motion in its orbit is slow, and the earth in consequence has a less space to follow, before any given place on its surface comes opposite to the sun; the sun at such time will be on the meridian of that place before the end of the twenty-four mean hours: and when the sun's apparent motion in his orbit is quickest, and when of course any given place on the earth's surface has a greater space to follow the sun, before it comes opposite to it; the sun will not be on the meridian of that place, till some time after the expiration of the twenty-four mean hours.

This inequality in the length of the natural days, is called the equation of time.

This equation of time is inserted in page 2, of every month in the Nautical Almanac for the noon of each day at Greenwich, and is marked subtractive when the sun comes to the meridian sooner, and additive when it comes to the meridian later than mean noon, and the meaning is, that the quantity of time expressed by the equation is to be subtracted, in the former case, from the apparent time, or that which is immediately observed from the sun, to obtain the mean time shown by clocks and watches, and added to it in the latter.

As every meridian, therefore, passes in the same time, through similar ones in the celestial equator, and all circles parallel to the equator [and such are the tropics at the solstices] every arc of the ecliptic passed through by the meridian, in a given time, will be to the arc of the equator passed through in the same time, as fifty-five is to sixty.

Mr. Ferguson explains this subject by a very easy problem; upon a common globe, if small patches of paper, (or any other mark) be put upon every tenth or fifteenth degree, both of the equator and the ecliptic, as described on the globe, beginning at Aries ♈, and turn the globe gently round, westward, we shall find all the patches, or marks on the ecliptic, from Aries to Cancer, come to the brazen meridian sooner than the corresponding marks on the equator. Those from Cancer to Libra will come later to the meridian than the marks on the equator, those from Libra to Capricorn sooner, and lastly, those from Capricorn to Aries later again.

The marks at the beginning of Aries, Cancer, Libra and Capricorn, will come to the meridian at the same time with the equator.

If a circle be supposed to circumscribe the globe, exactly in the middle between the two poles, that circle is called the equator. The circle which corresponds to it in the heavens is called the equinoctial.

The ecliptic is that great circle in the heavens which the sun appears to describe in a year, or, it is the real path of the earth round the sun, and cuts the equinoctial in an angle of 23° 28′. The points of intersection are as follows.

The ecliptic and the equator, (and these, being great circles, must bisect each other) and their intersection, is called the obliquity of the ecliptic. The method used by astronomers to obtain the obliquity of the ecliptic is taking half the difference of the greatest and least meridian altitude of the sun in winter and in summer.

The sun's right ascension is an arc of the equator, intercepted between the first point of Aries, and a declination circle passing through the sun, measured according to the order of the signs.

The sun's place in the ecliptic is called his longitude, and is reckoned in signs, degrees and minutes, each sign being thirty degrees. The declination of the sun, a star, or a planet, is its distance from the equinoctial northward or southward. When the sun is in the equinoctial, he has no declination, but enlightens the globe from pole to pole. As he increases in north declination, he gradually shines farther over the north pole, and leaves the south pole in darkness. In a similar manner, when he has south declination he shines over the south pole, and leaves the north pole in darkness. The greatest declination the sun can have is 23° 28′. The greatest declination a star can have is 90°, and that of a planet 30° 28′, north or south.

It is necessary to remark the equinoctial, which is a circle on the celestial globe, and is represented by the figure in the following page; beginning at the first point of Aries, and extending in a straight line. Consequently we must consider the two extremities as joining each other, that is, where one leaves off, the other begins.

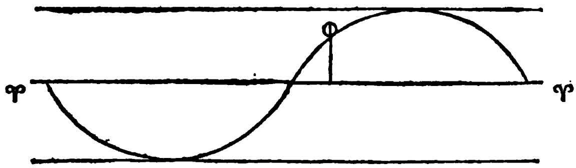
At the distance of twenty-three degrees and twenty-eight miles of declination north and south, two lines are drawn parallel to the equinoctial, which touch the ecliptic at the beginning of the signs, Cancer and Capricorn. See the following figure.

These lines are called tropics; the one on the north side, the tropic of Cancer; and that on the south side, the tropic of Capricorn.

In the following figure, the perpendicular line represents the sun's declination on the 20th July, 1820.

Fig. 16.

Tropic of Cançer represented by this line. North.



South. Line representing the tropic of Capricorn.

The curve line in the above figure represents the ecliptic, or apparent annual path of the sun among the stars, through which he advances eastward, nearly a degree every day. It is divided into twelve signs, from right to left, beginning at ♈, Aries, and the names and characters of them are as follows: each sign thirty degrees, making three hundred and sixty degrees from ♈ to ♈.

NORTHERN SIGNS.

1.	Aries, the Ram,	♈,	☉ enters,	March 28.
2.	Taurus, the Bull,	♉	„	April 20.
3.	Gemini, the Twins,	♊	„	May 21.
4.	Cancer, the Crab,	♋	„	June 21.
5.	Leo, the Lion,	♌	„	July 23.
6.	Virgo, the Virgin,	♍	„	August 23.

SOUTHERN SIGNS.

7.	Libra, the scales,	♎,	☉ enters,	Sept. 23.
8.	Scorpio, the Scorpion,	♏	„	Oct. 23.
9.	Sagittarius, the Hunter,	♐	„	Nov. 22.
10.	Capricornus, the Goat,	♑	„	Dec. 21.
11.	Aquarius, the Waterman,	♒	„	Jan. 20.
12.	Pisces, the Fishes,	♓	„	Feb. 18.

The time given in the foregoing statement is according to the civil account, from the 20th of March, 1820, to the 18th of February, 1821.

The Nautical Almanac gives the times at which the sun enters the different signs of the zodiac, according to astronomical account.

The Precession of the Equinoxes.

THE sun returning to the equinoxes every year, before it returns to the same point in the heavens, shows that the equinoc-

tial points have a retrograde motion; and this arises from the motion of the equator, which is caused by the attraction of the sun and moon upon the earth, in consequence of its spheroidal figure. The effect of this is, that the longitude of the stars must constantly increase; and by comparing the longitude of the same stars, at different times, the motion of the equinoctial points or precession of the equinoxes may be found.

The equinoctial points, according to Mr. Ferguson, retreat along the ecliptic, contrary to the order of the signs, at the rate of fifty seconds and three-tenths in the year; so that they will perform a whole revolution in the heavens in twenty-six thousand years.

Since the longitude of the stars, therefore, is reckoned from the vernal equinoctial point, and since this point recedes on the ecliptic, the longitudes of the stars must increase fifty seconds and three-tenths every year.

For reasons mentioned under the head of Reformation of the Calendar, page 38, the sun's declination became too much advanced. And as this is not allowed for in some of the old editions of the epitomes of navigation, say before the year 1800, a number of masters of vessels have taken out the declination one day wrong. I should have been led into this error myself, had I not been aware of it; and, not long since, having met with some erroneous epitomes in use, I think it best to mention it here as a caution, and to recommend the use of the Nautical Almanac, the declination therein being corrected every year.

This error is very great in March and September, nearly twenty-four miles in one day. In the year 1800, about the middle of March, being bound to the Havanna, I made use of one of Hamilton Moore's epitomes, printed before 1800. Knowing this error, I took the declination for one day earlier. Had I not been aware of it, I should have used the declination for the day as given in the epitome, and should have been about twenty-three miles out in the latitude.

Although the foregoing figure has been explained already, I must refer to it again, to show the mode of finding the sun's declination, his right ascension, and longitude, by spherical trigonometry. Thus, then, as before, the equinoctial, which is a circle on the celestial globe, is represented as beginning at the first point of Aries, and ending in a straight line, which, from the circular form of the earth, must surround it, and, of course, return to the point whence it set out.

Then, as before, the sun's place in the ecliptic being his longitude, and his right ascension, are reckoned on the equinoctial, the angle made by the intersection of the ecliptic and equinoctial

in the foregoing figure, is the obliquity of the ecliptic, which is equal to the sun's greatest declination, which, as before observed, is twenty-three degrees twenty-eight minutes either north or south.

Now the curve line in the figure representing the ecliptic, call the hypothenuse; the equinoctial, or straight line, the base; and a line perpendicular to the equinoctial, on any part, is the sun's declination.

To find the Declination of the Sun by Spherical Trigonometry.

As radius is to		10.00000
The sine of the obliquity of the ecliptic,	23° 28′	9.60012
So is the sine of the hypothenuse,	117° 35′	9.94760
To the sine of the declination,	20° 40′ 5″	9.54772

To find the Sun's Right Ascension.

As the co-tangent of the hypothenuse or	117° 35′	9.71802
Is to the co-sine of the obliquity of the ecliptic,	23° 28′	9.96251
So is radius,		10.00000
To the tangent of 119° 39′ 45″, the base,		10.24449

To find the Hypothenuse.

As the tangent of the base,	119° 39′ 45″	10.24449
Is to the co-sine of the obliquity of the ecliptic,	23° 28′	9.96251
So is radius,		10.00000
To the co-tangent of the hypothenuse,	117° 35′	9.71802

To find the Obliquity of the Ecliptic.

As radius,		10.00000
Is to the co-tangent of the hypothenuse,	117° 35′	9.71802
So is the tangent of the base,	119° 39′ 45″	10.24449
To the co-sine of the obliquity of the ecliptic,	23° 28′	9.96251

☞ If either side exceed ninety degrees, take it from one hundred and eighty degrees; and if it exceed one hundred and eighty degrees, take it from three hundred and sixty degrees.

Reformation of the Calendar.

Before the year 1800 many mistakes were made in the latitude, particularly near the beginning of that year, when the declination was advanced one day; but it was at that time corrected; the cause of which error I shall here explain.

The year consists of only three hundred and sixty-five days, five hours, forty-eight minutes, and forty-five and a half seconds; and adding, therefore, to every fourth year a whole day, gives eleven minutes and fourteen seconds and a half too much. This quantity, though small in itself, in the course of many years amounts to a considerable sum.

In the year 1582, during the pontificate of Gregory XIII. the equinoxes had advanced ten days, so that the vernal equinox, instead of falling on the 20th, fell on the 30th day of March. This irregularity caused much inconvenience with respect to the festivals of the church. The pope, therefore, with the advice of the ablest astronomers, reformed the calendar, having calculated that the surplus time, viz. eleven minutes and fourteen seconds, which had been added to the leap year, must amount to a whole day in one hundred and thirty-three years, and that, consequently, from the time of the Nicene council, A. D. 326, the equinox had fallen back eleven days, they struck off at once eleven days from the current year; so that the vernal equinox then fell on the 21st of March; and it was further agreed to omit three of the leap years in four hundred years. This arrangement has already been put in practice, in the years 1700 and 1800, which would have been leap years in the usual course, but were not observed as such. Even this plan is not quite perfect; for, since the eleven minutes and fourteen seconds compose an entire day at the end of one hundred and twenty-eight years, instead of one hundred and thirty-three years, this will still cause an error of one day in three thousand two hundred years; so that, at the end of the year 4800, it will again be necessary to retrench another day.

Navigators, in working for their latitude, should always allow the variation, or correction of the sun's declination, between Greenwich and the place of observation: for, by omitting this correction, there will be a considerable difference between the latitude found in March and the latitude found in Septem-

ber, though both observations are taken with the same instrumaet; which error is considerable, if the longitude should differ much from that of Greenwich: for in March the sun is altering its declination at the rate of twenty-three miles and a half every twenty-four hours to the northward, which is nearly a mile an hour; and in September the sun is altering his declination to the southward at the same rate that it did to the northward, and of course the same error will take place as before, but the contrary way. I am of opinion that the omission of this correction has been the cause of the errors in latitude in many places; and in working for the apparent time, it is also highly necessary to allow this correction; directions for which are given in the epitomes of navigation.

To Ascertain the Apparent Time by the Rising or Setting of the Sun.

As it may sometimes happen that, for want of a better opportunity, it may be important to find the apparent time by the rising or setting of the sun, I shall endeavour to explain the best method of doing it, as it is subject to errors arising from the variation of horizontal refraction, to which the sun is liable when in the horizon.

In high latitudes, the time observed by this method will vary from one to four minutes, depending on the latitude and the variation of the refraction.

Within the latitude of 35 I have found it, by a comparison with observations had the same afternoon to agree with a good watch, previously regulated by an altitude of the sun, within from fifteen to thirty seconds.

In an extraordinary refraction no dependence can be placed in the time obtained by the above method. This, however, will be perceived by the oval appearance of the sun, the lower edge being considerably more refracted than the upper.

The declination, in the tables for finding the time of the sun's rising and setting are calculated only to degrees, and the time to hours and minutes, but may be proportioned to the inferior denominations.

The declination is to be reduced to the meridian of the place of observation in the same manner as in finding the apparent time by the sun's altitude.

Allowing that the refraction of the sun, when in the horizon, to be thirty-three miles, and the dip about four miles, this will

make thirty-seven miles which the sun's centre will appear above the horizon. The tables in the epitomes of navigation are calculated for the centre to be in the horizon; therefore, taking sixteen miles, which is equal to the sun's semi-diameter, from thirty-seven miles, there remains twenty-one, agreeing to about two-thirds of the sun's diameter; so that, when the sun's lower limb appears two-thirds of his diameter above the horizon, in reality his centre is in the horizon, or, in other words, it is then sun-set.

One of the glass screens of a quadrant will be useful to take off the glare of the sun. See the following figures.

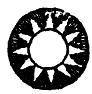


Fig. 17.

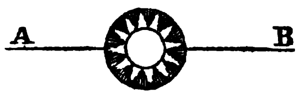


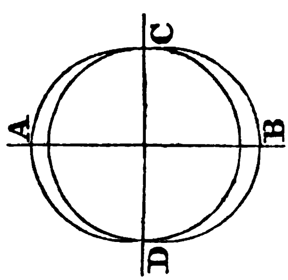
Fig. 18.

Figure 17 represents the sun with his lower edge two-thirds of his diameter above the horizon; and when he appears here, he is in reality set, as in figure 18; and in rising, he will not be risen until his lower edge appears two-thirds of his diameter above the horizon, as in figure 17. A B represents the horizon.

Of the Spheroidal Figure of the Earth.

THE spheroidal figure of the earth, or its being flattened at the poles, and swelled at the equator, which is occasioned by its rotation on its axis, will be understood by a reference to the following figure.

A B Equator.



C D Poles.

From the above figure it is clear that a ship must sail a

greater distance on a meridian in a high latitude, to obtain a degree, than near the equator.

A degree of latitude was measured in England, between London and York, and it was found to contain sixty-nine and a half English statute miles, differing from the sea miles. The length of a mean degree of latitude is settled at sixty-nine and one-tenth of the same miles.

Care should be taken not to confound this increase of the degrees of latitude (which is so small as to be of little or no consequence in navigation) with the lengthening of the degrees on Mercator's chart; that being another affair, in which the degrees are extended, to make them correspond with the degrees of longitude, which are all equal on the charts, and without which the globe could not be correctly represented on a chart.

Remarks on Sixteen of the most remarkable fixed Stars.

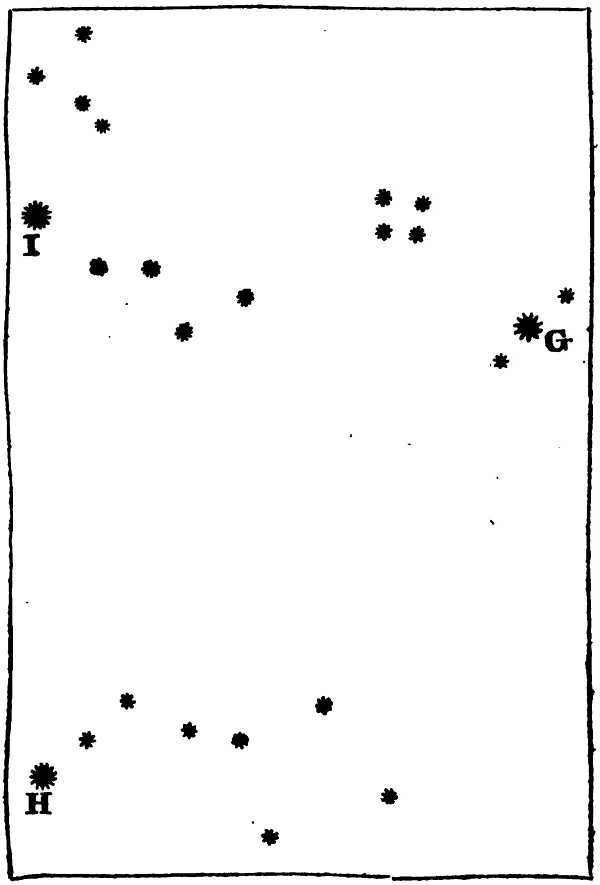
The first nine are given in the Nautical Almanac, and are used for the lunar observations: they will serve also for obtaining the latitude and the apparent time. In this work they are respectively designated by the first nine letters of the alphabet. The other seven will serve for obtaining the latitude and apparent time, and are respectively marked with figures from 1 to 7. Their appearance, with respect to each other, is hereinafter shown, and their right ascension and declination are given in the different epitomes of navigation. The figures of these stars will appear contrary, when you pass their declination; that is, they will then appear upside down, and also when they have passed the meridian; but will always retain their bearings and distance with respect to each other.

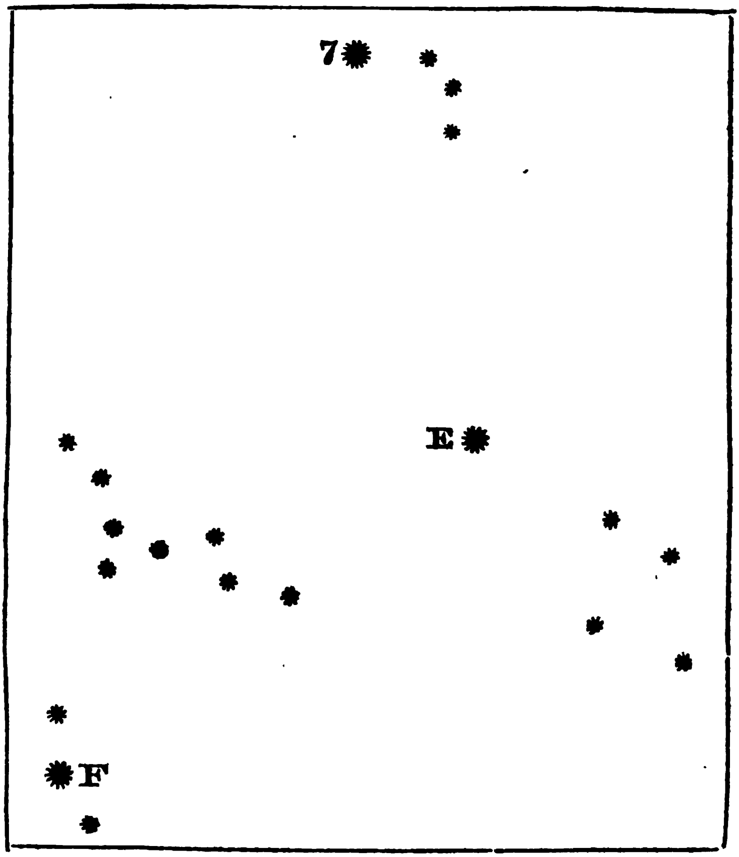
Arietes bears west distance 23° from the Pleiades, or Seven Stars, and is of the second magnitude.

Aldebaran bears east by south 35° from Arietes, and appears, as described by the figure, with six or seven stars near it, of the third magnitude, forming with Aldebaran the letter V.

Pollux bears east north-east, distance 45° from Aldebaran, and is nearly of the first magnitude: north-west distant from Pollux 5° is the star Castor, nearly of the same magnitude, and you will almost always sweep them at the same time. The southernmost is the one to be used for measuring the distance

in longitude of fifteen miles; for this reason, when taking the distance by a star, in the latter case, it would be best to select one of those whose right ascension and declination are given in the epitome, and which is of the first magnitude, for obtaining the apparent time, and take an altitude of a star as near the east or west, and as near the time of measuring the distance, as possible; find the error of the watch therefrom, and allow for it; that is, when the star by which the distance is taken should be near the meridian, or when there should be much difference between the declination of the star and the latitude of the ship.

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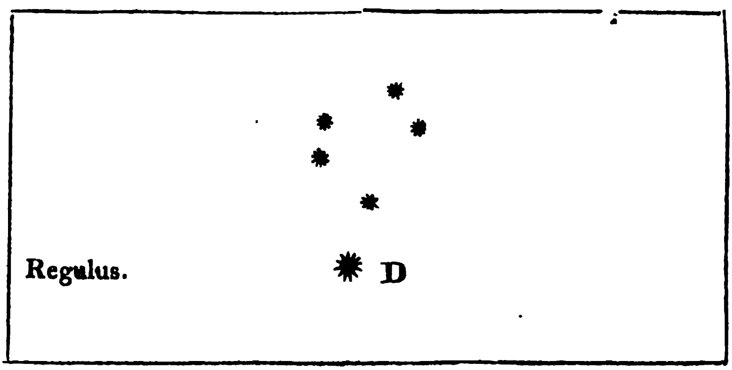
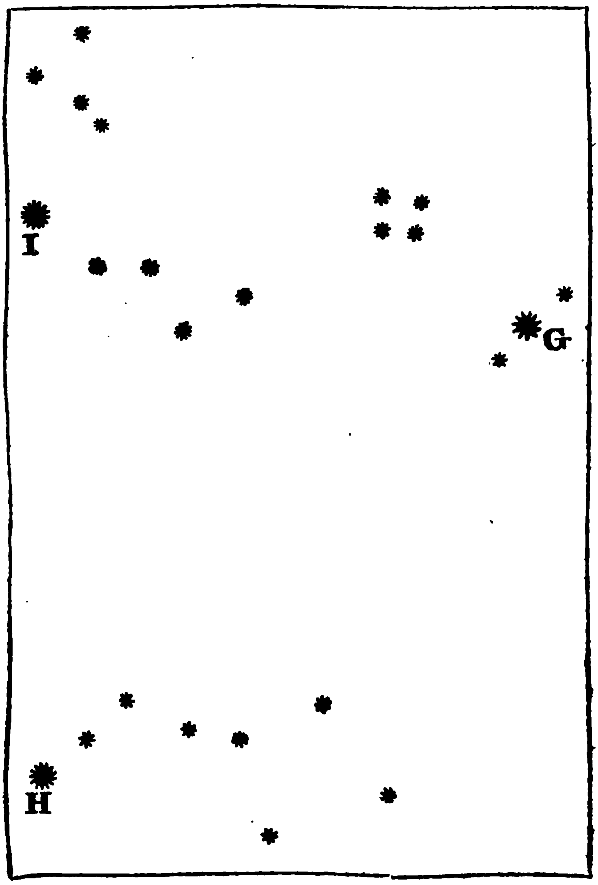
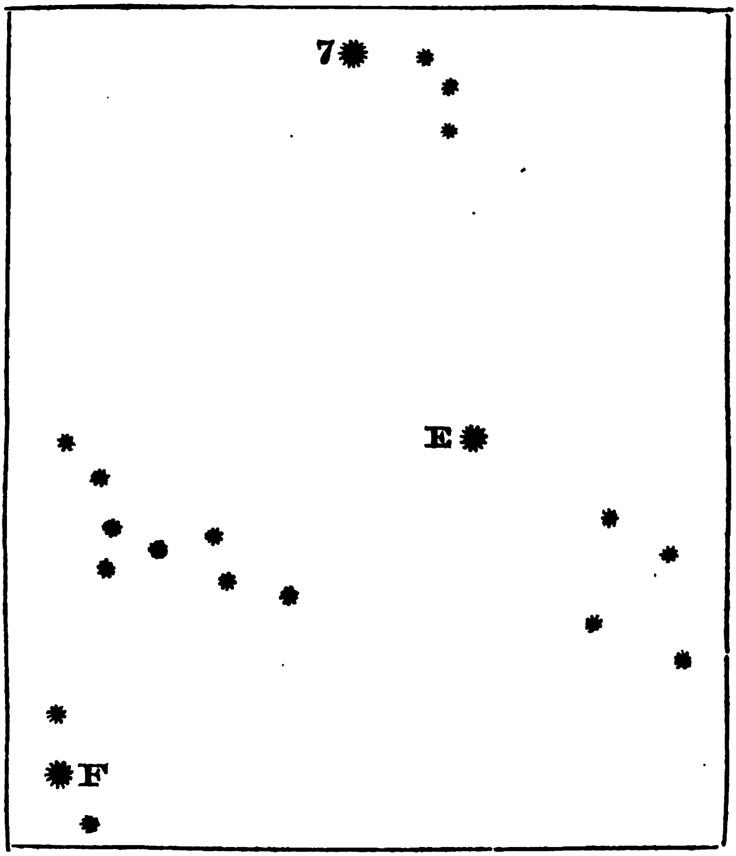

Regulus.
D

in longitude of fifteen miles; for this reason, when taking the distance by a star, in the latter case, it would be best to select one of those whose right ascension and declination are given in the epitome, and which is of the first magnitude, for obtaining the apparent time, and take an altitude of a star as near the east or west, and as near the time of measuring the distance, as possible; find the error of the watch therefrom, and allow for it; that is, when the star by which the distance is taken should be near the meridian, or when there should be much difference between the declination of the star and the latitude of the ship.

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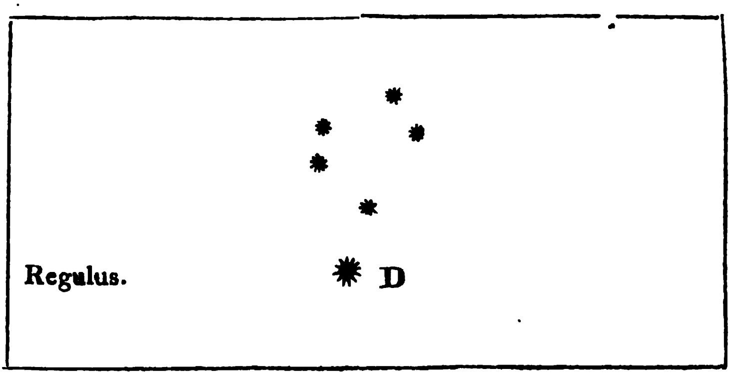
Regulus.
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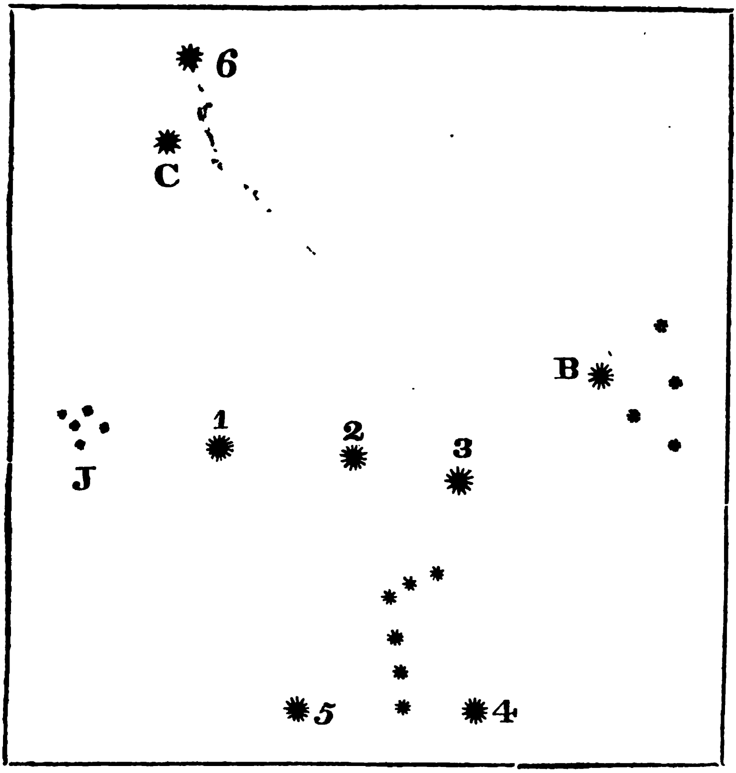
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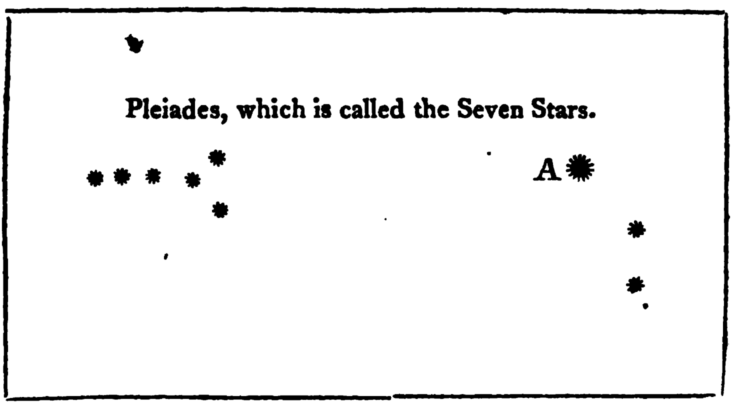
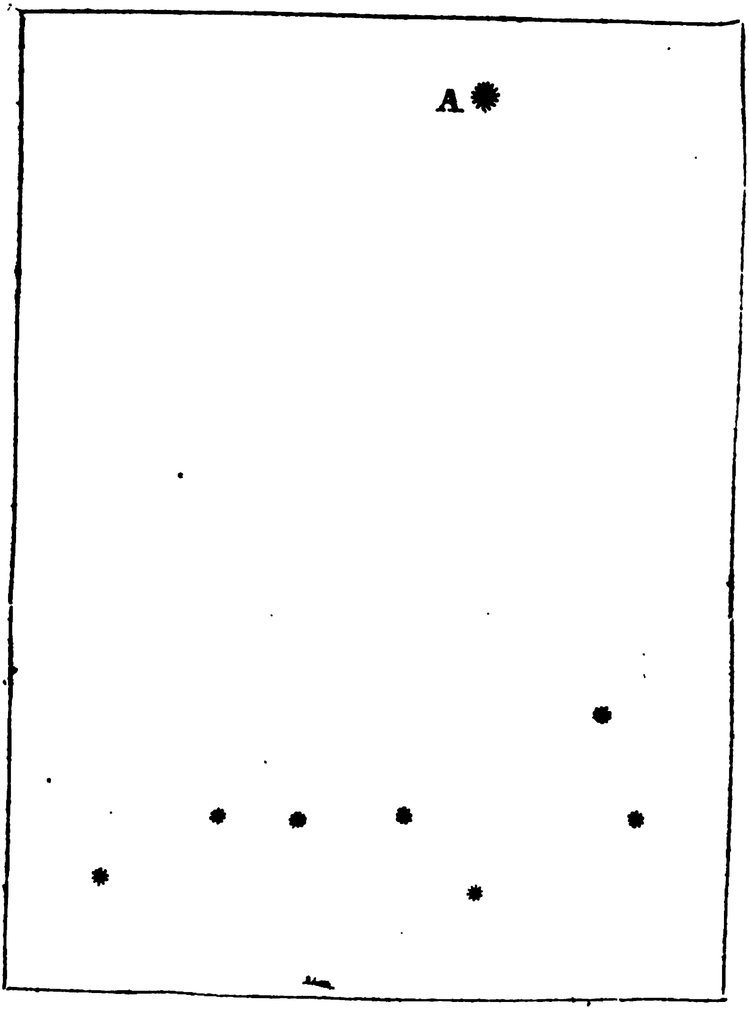

Pleiades, which is called the Seven Stars.
A


A

On the Polar Star.

The north polar star may be of material use to those who are not acquainted with the other Stars. It frequently happens, that during the day the weather is hazy, but becomes clear at night. The fogs and mists which are occasioned by the action of the sun's rays, often disappear when the sun retires below the horizon; for the atmosphere becoming more cool, the vapours condense, and fall, and the stars appear.—Fogs are very usual about the Cape de Verde islands. Captain Coffin, whom I saw at the Isle of May, informed me that he had performed sixteen voyages to those islands, and that he had been frequently obliged to run for them, by latitude obtained from the north polar star; the weather having been hazy during the day. With a good horizon the latitude may be obtained by this star, within about fifteen miles. The appearance of this star, and the great Bear, which includes its pointers, are exhibited in the following pages.

Cautions to be observed in taking the Distance.

IN reading off your distances and altitudes from your instruments, it is highly necessary to observe carefully whether they are correctly set down on the slate by the person intrusted with that charge; as, in the course of my practice, I have frequently noticed the figures misplaced, as 98 for 89, 45 for 54, &c. and it frequently happens, that this person does not rightly hear or understand when the altitudes or distances are called out.

Persons taking the altitudes, should be cautioned to clamp their quadrants before taking them from the eye; as the index has frequently been moved out of place by its own weight.

In taking several sets of observations, it is necessary to observe at what rate the objects rise and fall; to discover if any error arise. Here the watch is peculiarly necessary to inform you when you get your altitudes or distances regular; although the apparent time may be immediately deduced from the altitude of the sun.

I have heard some mariners affirm, that the watch is unnecessary when the apparent time can be obtained at the time of getting the distance. In that case I hold with them, that it is only of importance to determine if the sights are well taken, and no mistake has occurred, either in distance or altitude.

When there is a high sea, the persons taking the altitudes should wait a few seconds after the distance is set, if they are

not gotten at the same instant; as a few seconds in time will not affect the observation so much as if the altitude were taken in the hollow of the sea. It will affect the distance but a trifle; but in working the time, it might make some difference. In that case it would be better to have the watch held, and an altitude taken by the sextant, say a few minntes before taking the distance; then go by the watch, and whatever error may arise will only affect clearing the distance, which will be trifling.

When the sun is rising or falling at the rate of eight or nine miles in a minute, and, as in working the time, eight or nine miles error in altitude will make one minute of time, and consequently, will occasion an error of fifteen minutes of longitude; and so on in proportion.

If a good lunar is much wanted, and there is a very high sea, it will be better, if you have plenty of sea-room, to take in some sail, or ease the ship in some manner; as when she is surging and pitching heavily, it will be difficult to get good distance. I have, in such cases, taken in the light sails and hauled up the mainsail. The best criterion is to observe by the watch if the distances agree with the difference in the Nautical Almanac.

Whatever number of sets of observations may he taken, they should be done within fifteen minutes, as otherwise they might be affected by change or variation of parallax.

In observing the difference between the moon or star, it requires a number of sets of observations to be tolerably correct; and, as it will occupy more time than by the sun and moon, if you cannot get three, five, or more sets in fifteen minutes, it will be better to take several observations, work them separately, and then take the mean of their longitudes, as, in that case, they will not be affected by change or variation of parallax.

In taking a lunar by the moon and a star, it is important to have your apparent time as correct as possible: if the star by which you get the distance does not rise nor fall quick enough to obtain the apparent time accurately by it, it would be advisable to select one of those stars of the first magnitude, which are inserted in the epitome, when the change of altitude is rapid, (for the greater the rapidity of the change of altitude, the less will be the error in getting the apparent time) holding the watch and bringing the time forward; it is much better to get the time by a star of that kind, and to go by the watch, than to trust to the star by which you get the distance, if its altitude does not change more than six or seven miles in a minute. The nearer the latitude of the ship and the declination of the star agree, the quicker will be the change of altitude, and the contrary if far removed. It sometimes happens that you get the dis-

tance by the star too near its meridian to get the time by it. In such case I have found it best to get an altitude of the sun the afternoon previous to the time of taking the distance; and the apparent time being noted, to reduce it to the time of taking the observation, by the watch, in case the rate may be depended on.

The adjustment of the instrument should be particularly attended to; and care should be taken to find and allow for the index error. (See Plate VII.) The inverted telescope should be used in preference to the direct, as it happens that by the direct telescope the objects will vibrate; that is, will sometimes lap, and then separate, especially in large distances, and this will make the observation erroneous. I have often found the odjects vibrate when the direct telescope is used, which did not take place with the inverted telescope. When the objects vibrate you cannot depend on your observation. The plain tube should be rejected altogether; no manner of dependance can be placed on it.

Care should be taken to preserve the adjustment of the sextant, and the telescope should always be brought to its focus before it is screwed into the ring which is fastened in the socket; for in drawing it out afterwards the screws might be strained, and the telescope thus thrown out of its adjustment.

The screws of the sextant should never, if possible, be meddled with, as they are extremely delicate, and if frequently screwed backwards and forward, will soon lose their fine edge, and, in consequence, the sextant will soon lose its adjustment.

On the sun and moon first coming into distance it is advisable not to trust to it; as when the distance is small, and the sun shines very bright, his glare is so strong as to bury the defined edge of the moon; in that respect therefore, caution is necessary.

A person, to become a good lunarian, should work a number of observations to acquire practice and expertness, and thereby be less liable to mistakes. I have accordingly inserted a number of distances, to exercise the learner.

On the Difference between the Civil and Astronomical Day.

The civil day begins at midnight, and ends at the midnight following. The astronomical day begins at noon, and is reckoned through the twenty-four hours, from noon to noon: and what is called 6 A. M. on the second of the month, civil account, is eighteen hours on the first astronomical account, &c.

but what is called 6 P. M. civil account, is also six hours afternoon, astronomical account. Civil account and astronomical account are of the same name from noon to midnight; when they change, as above-mentioned.

The sea day is one day later than the astronomical day.

Having the observed Distance and observed Altitudes, to find the apparent Distance and apparent Altitudes.

Rule I. Turn the ship's longitude into time (by allowing 15° to an hour, 1° to four minutes, one mile to four seconds, or more briefly by Table XIII.) and add it to the time at ship, if you are in west longitude, but subtract, if you are in east longitude; the sum or remainder will be the supposed time at Greenwich, which is called reduced time.

Rule II. From page 7 of the month, in the Nautical Almanac, take out the moon's semi-diameter and horizontal parallax, and reduce them to this reduced time.

The moon's semi-diameter and horizontal parallax are reduced to the supposed time at Greenwich, thus:—take them out for the nearest noon and midnight, before and after the reduced time, and find their difference; then say, as twelve hours is to the difference in twelve hours, so is the reduced time since the preceding noon or midnight to a proportional part; which sum, so found, is to be added to, or subtracted from the semi-diameter or horizontal parallax, at the preceding noon or midnight, according as it is increasing or decreasing, which will give them reduced to the supposed time at Greenwich; or they may be more briefly proportioned by Table XI.

If the reduced time exceed twelve hours, it will fall in after midnight, and before noon; but, if less than twelve hours, it will fall in the afternoon; thus, suppose, on the sixth of the month by Nautical Almanac, the reduced time is three hours in the afternoon:

Moon's semi-diameter at noon,	-	15′ 13″
Do. do. at midnight,	-	15 21
Difference in twelve hours,	- -	0 8

Then say, if twelve hours give 8″, what will three hours give: the answer will be 2″; and as the semi-diameter is increasing, this must be added to 15′ 13″, which gives 15′ 15″.

If the reduced time, on the fifth by Nautical Almanac, should fall at eighteen hours, which is six hours after mid-

night, on the fifth, or six hours before noon on the sixth, the semi-diameter must be taken out for midnight on the fifth, and noon on the sixth.

Suppose the moon's semi-diameter on the fifth at midnight, - - - - - -	15′ 14″
And on the sixth at noon, - - -	15 23
Difference in twelve hours, - - -	0 8

Then say, if twelve hours give 8″, what will six hours give? Answer 4″, which, added to 15′ 14″, gives 15′ 18″.* But if the semi-diameter had been decreasing, the 4″ should have been subtracted, which would give 15′ 10″. In this manner, also, you must proceed with respect to the horizontal parallax.

From Table VIII. take out a number of seconds, answering to the moon's apparent altitude (which will be the augmentation of the moon's semi-diameter); which add to the moon's reduced semi-diameter, and their sum will be the moon's true semi-diameter.

In west longitude, when the sum of the longitude in time, and the time at ship, exceed twenty-four hours; twenty-four hours must be subtracted from it, and the remainder will be the reduced time, counted from noon the following day.

In east longitude, when the longitude in time is greater than the time at ship, add twenty-four hours to the time at ship, and subtract the longitude in time from it, and it will give the reduced time counted from noon of the preceding; and in every operation where one time is to be taken from another, add twenty-four hours to the time you subtract from, if the time which is to be taken from it be the greatest, and the remainder must be reckoned from noon the preceding day; and when one time is to be added to another, if the sum exceed twenty-four hours—take twenty-four hours from it, and the remainder must be reckoned from noon the following day.

On the sixth of the month, at two hours in the afternoon, by Nautical Almanac, in longitude by account 60° east, the reduced time be required.

EXAMPLE I.

Time at ship,	2 hours.
	+ 24
	26
Longitude 60° east in time,	4
	22 hours on the day

* The moon's semi-diameter and horizontal parallax may be proportioned to reduced time, by Table XI. in this book.

preceding the sixth, which is twenty-two hours on the fifth by the Nautical Almanac. In this case the moon's semi-diameter and horizontal parallax must be taken out of the Nautical Almanac, for midnight, on the fifth, and noon on the sixth, and proportioned to the reduced time, by the preceding rules.

Again, on the sixth at four in the forenoon, civil account, which is sixteen hours on the fifth, by Nautical Almanac, in longitude 45° east.

EXAMPLE II.

Time at ship,	16 hours on the fifth.
Longitude 45° east,	3 hours.
Reduced time,	13 hours.

In this case the moon's semi-diameter and horizontal parallax must be taken out of the Nautical Almanac, for midnight on the fifth, and noon on the sixth, and proportioned as abovementioned.

On the sixth, at four hours in the forenoon, civil account, which is sixteen hours on the fifth by Nautical Almanac, in longitude 120° east, the reduced time is required.

EXAMPLE III.

Time at ship,	16 hours.
Longitude 120° east, on time,	8
Reduced time,	8

In this case the moon's semi. diameter is taken out of the Nautical Almanac for noon and midnight on the fifth, and proportioned to reduced time.

On the sixth at two hours in the afternoon, by Nautical Almanac, in longitude 60° west, reduced time is required.

EXAMPLE IV.

Time at ship,	2 hours.
Longitude 60° west, in time,	4
Reduced time,	6 hours.

In this case the moon's semi-diameter and horizontal parallax must be taken out of the Nautical Almanac, both for noon and midnight on the sixth, and reduced as aforesaid.

On the sixth, by Nautical Almanac, at eight hours in the afternoon, in longitude 90° west by account.

EXAMPLE V.

Time at ship,	8 hours.
Longitude 90° west, in time,	6
Reduced time,	14 hours.

In this case the moon's semi-diameter and horizontal parallax, must be taken out for midnight and noon on the sixth, and reduced as before-mentioned.

On the sixth, at eight hours in the afternoon, by Nautical Almanac, longitude 60° west, the reduced time is required.

EXAMPLE VI.

Time at ship,	8 hours.
Longitude 60° west, in time,	4
Reduced time,	12 hours.

In this case the moon's semi-diameter and horizontal parallax, must be taken out of the Nautical Almanac, on the sixth, for midnight only.

EXAMPLE VII.

On the sixth at noon,	00
	24
Longitude 120° east, in time,	8
Reduced time on the fifth,	16 hours.

In this case the moon's semi-diameter and horizontal parallax must be taken out of the Nautical Almanac, for midnight on the fifth, and noon on the sixth.

EXAMPLE VIII.

Again, on the sixth at noon,	00
Longitude 120° west, in time, add,	8
Reduced time past noon, on the sixth,	8 hours.

The moon's semi-diameter and horizontal parallax must be taken out, and for noon and midnight on the sixth.

On the sixth, at eight hours before noon, civil account, which is twenty hours on the fifth by Nautical Almanac, in longitude 60° west, required the reduced time.

EXAMPLE IX.

Time at ship,	20 hours on the fifth, by N. A.
Longitude 60° west in time,	4 hours.
Reduced time,	24

In this case the moon's diameter and horizontal parallax must be taken out, for noon on the sixth only.

On the sixth, at ten hours before noon, civil account, which is twenty-two hours on the fifth, by Nautical Almanac, in longitude 90° west, required the reduced time.

EXAMPLE X.

Time at ship,	22 hours.
Longitude 90° west, in time,	+ 6 hours.
	28 hours.
	— 24
Reducd time,	4 hours.

In this case the moon's semi-diameter and horizontal parallax must be taken out of page VII of the month in the Nautical Almanac, for noon and midnight on the sixth, and reduced as above.

The sun's semi-diameter is given in page III of each month, in the Nautical Almanac for every sixth day; no augmentation is applied to the sun's semi-diameter.

Rule III. To the moon's observed altitude, add 12′, if the lower limb be taken, but if the upper limb be taken, subtract 20′; to the observed altitude of the sun's lower limb add 12′, and from the star's observed altitude subtract 4′, and you will have their apparent altitudes.

To the observed distance of the sun and moon add their semi-diameters, and you will have their apparent distance.

To the observed distance of the moon and star, add the moon's semi-diameter, if the nearest limb be taken; but subtract it, if the farthest limb be taken: their sum or difference will be the apparent distance.

It must be remembered, that, if there be an index error, that also, must be either added or subtracted, as the case may require, in order to obtain the apparent distance.

Having the true Distance, to find the Longitude.

Among the true distances of the moon's centre from the sun or fixed star, as given in pages VIII, IX, X and XI, of each month in the Nautical Almanac, find, on the given day, those two distances that are the next less and next greater than the true distance found by observation, which two distances place under the true distance found by observation. Take the difference between the true distance, and the first of the two dis-

tances; also the difference between the two distances. Subtract the proportional logarithm of the second difference from the proportional logarithm of the first difference, and the remainder will be the proportional logarithm of a portion of time, which add to the time standing over the first of the two distances taken from Nautical Almanac, and the sum will be the apparent time at Greenwich. Take the difference between the apparent time at Greenwich, and the apparent time at ship, converted into degrees and minutes, at the rate of one hour to 15°, four minutes to one degree, and four seconds to one mile (or more briefly by Table XII.) and it will give the true longitude of the ship; which will be east, if the time at ship be greater than the time at Greenwich reckoned from the same noon,* but west, if the time at ship be less than the time at Greenwich.

April 12th, 1817, the true distance of the sun and moon's centres, was 44 46 14. Required the apparent time at Greenwich.

EXAMPLE I.

True distance,	44 46 14				
1st dist. in Naut. Alm. at noon,	45 15 21				
2d do. do. at 3 hours,	43 51 51				
	0 29 07	p. log.	7911		
	1 23 30	p. log.	3336		
Difference of proportional logarithms,			4575	=	$1^h\ 2'\ 46''$
Time over first distance,					12 0 0
Apparent time at Greenwich,					13 2 46

N. B. There is no difference of cases, as you always take the difference between the true distance, and that standing first in the Nautical Almanac, and also the difference between the two distances found in the Nautical Almanac.

Examples for working Lunar Observations.

IN taking a lunar observation, two assistants are usual to observe the altitudes of the objects, while the principal takes the distance. If it be near noon when the observation is taken, the

* Suppose a ship's time to be two hours on the sixth, by Nautical Almanac, and Greenwich time twenty-two hours, counted from the fifth, and the ship's time counted from the fifth, will give twenty-six hours. Difference between twenty-two and twenty-six is four hours, which gives longitude 60° east.

watch used must be one that has been previously regulated by an observation of the sun's altitude, taken at a time when he was at least two or three hours from the meridian, or, error found; by which you will note the time of taking your observation. A good watch, indeed, on all occasions is useful, to ascertain whether the distances or altitudes are uniform, so that you may know whether or not they be well taken.

If the sun or star be at a proper distance from the meridian, the time may be inferred from its altitude.

When the error of the watch is found to give the apparent time, for the purpose of finding the longitude by lunar observation, the lunar observation will give the longitude at the time when the error of the watch was found.

A lunar observation may, however, be taken by only one observer, in the following manner. Take the altitudes of the objects before and after the distance is observed, and note the time of each observation by watch; and according as the objects are either rising or falling, proportion their altitudes to the time of taking the distance.

There are many different methods of working lunar observations; but in all the preparations are the same. The methods differ only in the manner of clearing the apparent distance from the effects of parallax and refraction.

A Short Method of Correcting the Apparent Distance of the Moon from the Sun or Star.

INVENTED BY THE AUTHOR.

RULE.

ADD together the apparent distance and apparent altitudes, and take half their sum; the difference between the half sum, and the sun or star's altitude, call the first remainder; and the difference between the half sum and the moon's apparent altitude, call the second remainder; then set down the sine of the apparent distance in two columns; the secant of the half sum also in both columns; the cosecant of the first remainder to be placed in the first column, and the cosecant of the second remainder in the second column; then enter Table I., with the moon's apparent altitude and horizontal parallax, and take out the corresponding logarithm, which place in the first column; then enter Table II., if the star is used, or Table III., if the sun is used; and take out a corresponding logarithm, which place in the second column. The sum of these four logarithms, rejecting the 10's in the indexes, in the first column, will be a

proportional logarithm of the first correction; and the sum of the four logarithms in the second column, rejecting the 10's in the indexes will be a proportional logarithm of the second correction.

Add to the apparent distance the first correction, and the correction of the sun or star's altitude, and subtract the sum of the second correction, and the correction of the moon's altitude, will give the corrected distance.

Then enter Table VII. with the corrected distance at the top, with the difference between the first correction, and the correction of the moon's altitude in the left side column, and also in said table, with the correction of the moon's altitude in the left side column, and take out two corresponding numbers. The difference between the two numbers is to be added to the corrected distance when less than 90°, or subtracted if above 90° which will give the true distance. The above method is short, and has the peculiar advantage of not requiring any distinction of cases, by which it is much simplified.

Directions for proportioning the Logarithms, from Table I.

Enter Table I., with the nearest degree of the moon's apparent altitude at the top, and with the minutes and less tens of seconds of the moon's horizontal parallax in the side column, and take out a corresponding logarithm, and if there should be units of seconds of parallax, enter Table A. with the units of seconds in the left side column, opposite to which in column marked corrections, is a number of seconds which subtract from the aforesaid logarithm, the remainder is the logarithm sought.

Examples as follows:

EXAMPLE I.

For moon's apparent altitude 56° 30′ at the top, and moon's horizontal parallax 54′ 47″, in the side, opposite to 54′ 40″, and under 56° 00 is logarithm 2258; then in small Table A., in the same page, for the 7″ of ☽'s horizontal parallax, is nine to be subtracted from logarithm 2258, which gives 2249, the logarithm required.

EXAMPLE II.

For horizontal parallax 55′ 36″; moon's apparent altitude 29° 06′, the moon's altitude at the top 29° 00, and moon's horizontal parallax 55′ 30″, in the side, the corresponding logarithm is 2255,

in Table A., in same page for the six seconds opposite six in column of correction, is nine, which, subtracted from 2255, leaves 2246, the logarithm sought.

EXAMPLE III.

For horizontal parallax 56′ 18″, and moon's apparent altitude 16° 30′ opposite to the moon's horizontal parallax 56′ 10″, and under moon's apparent altitude 16° 30′, is logarithm 2311 in Table A., opposite to eight in column of correction, is eleven to be subtracted from logarithm 2311, which gives 2300 the logarithm sought.

EXAMPLE IV.

Moon's horizontal parallax 58′ 20″, and moon's apparent altitude 71° 43′, opposite to 58′ 20″, and under 72°, which is the nearest degree of the moon's altitude, is logarithm 1958, which is the logarithm sought, being no units of seconds in the horizontal parallax.

EXAMPLE V.

Moon's horizontal parallax 59′ 12″, and moon's apparent altitude 79° 37′: opposite to moon's horizontal parallax 59′ 10″, and under moon's apparent altitude 80, is logarithm 1892. Table A. opposite to two seconds is two, which subtracted from logarithm 1892, leaves 1890 the logarithm.

The nearest degree of moon's apparent altitude is sufficiently near, but the units of seconds of horizontal parallax, must be proportioned in Table A., as above.

Logarithm from Table I.

EXAMPLE VI.

For horizontal parallax 61 4, and moon's apparent altitude 41 2, with the moon's horizontal parallax 61 at the side, and moon's altitude 41 at the top, in the angle of meeting is 1792; and in Table A., in same page, for four seconds of horizontal parallax, is in column of correction six, which, being subtracted from logarithm 1792, leaves 1786, logarithm sought.

For finding the Correction of the Moon's Altitude.

Enter Table VI. with the moon's apparent altitude to the nearest less tens of a minute in the left column, and minutes of horizontal parallax at the top (the proportional part, for odd mi-

nutes of altitude, is found at the bottom of the page.) The proportional part for seconds of horizontal parallax is to be taken from small Table C. in the same page, observing that when the moon's apparent altitude is less than 10°, to take the proportional part out with the nearest degree of moon's apparent altitude at the side, and odd minutes of altitude at the top, in the column of meeting will be the odd seconds of parallax to be applied as directed in small Table B.

The proportional part for the odd seconds of parallax is to be taken from small Table C. in the same page, opposite the nearest less tenth second, and under the unit of seconds.

For finding the Correction of the Moon's Altitude.

EXAMPLE I.

Required the correction of the moon's altitude corresponding to the moon's apparent altitude 56° 30′, and horizontal parallax 54′ 47″. The correction in Table VI., opposite the moon's apparent altitude 56° 30′, and under 54′ horizontal parallax is 29′ 11″, then in Table C., opposite the nearest less tens of seconds, which is, will be opposite to forty in the first column, and under the unit of seconds, which is 7″, the 40′ at the side and the 7′ at the top is 47 odd seconds; so that in the angle of meeting is 27″: these 27″ being added to the 29′ 11″ makes 29′ 38″ for the correction of the moon's altitude.*

As in this case there is no units of minutes of moon's altitude, of course there is no proportioning for the altitude.

EXAMPLE II.

Required the correction of the moon's altitude, corresponding to moon's apparent altitude 29° 6′, and horizontal parallax 55′ 36″, the correction in Table VI. to the altitude 29° 00′, and horizontal parallax 55′ is = 46′ 24″, and the proportional part from small Table C. is 33″ + and 2″ for altitude subtracted, gives the moon's correction 46′ 55″.

EXAMPLE III.

Required the correction of the moon's altitude 16° 30′, and moon's horizontal parallax 56′ 18″, the correction in Table VI.

to altitude 16° 30′ and parallax 56′ is	50′ 31″
For seconds of parallax 18 gives	17
Correction of moon's altitude,	50 48

* The correction corresponding to units of seconds of parallax, is taken from Table C. thus, opposite to 0, and under the units will be the correction sought.

EXAMPLE IV.

Required the correction of the moon's altitude—moon's altitude 71° 43′, and horizontal parallax 58′ 20″, the correction from Table VI. for horizontal parallal 58′ and altitude 71° 40′, is

	17′ 56″
Proportional part from Table C. 20″ is	5
	18 01
Proportional part for moon's altitude,	3
Moon's correction,	17 58

EXAMPLE V.

Required the correction of the moon's altitude 79° 37′, and horizontal parallax 59′ 12″; correction for moon's altitude from Table VI. 79° 30′, and hor. par. 59′, is

		10′ 35″
Proportional part to altitude, is	7″	4
Horizontal parallax,	3	
	4	☽ correction 10 31

EXAMPLE VI.

Required the correction of the moon's altitude corresponding to moon's altitude 41° 2′, and moon's horizontal parallax 61′ 4″, in Table VI. with the moon's horizontal parallax 61′ and moon's altitude 41° in the angle of meeting is 44′ 57″, and for proportional part for 4″ of parallax in Table C. opposite to 0, and under 4′ is 3′, which add to 44′ 57″, gives 45′ 00″, and for two miles of moon's altitude at the bottom of the same page is 1″, which subtract from 45 00″, leaves 44′ 59″ for moon's correction.

The logarithm answering to the star's altitude, is found in Table II., and is taken out to the nearest degree and minute of altitude, in the opposite column.

The logarithm answering to the sun's altitude is found in Table III., and is taken out to the nearest degree and minute of sun's altitude in the opposite column.

The correction of star's altitude is found in Table IV., opposite to the nearest degree and minute of star's altitude in the opposite column.

Correction of the sun's altitude is found in Table V., to the nearest degree and minute of altitude in the opposite column.

The preceding examples of corrections of the moon's altitude and logarithms, are for the examples of the lunar observations given in this book.

Lunar Observations taken on board the ship Mount Vernon, from Marseilles towards Havanna, on the 12th day of April, 1817.

On the 12th of April, 1817, at 10^h 10′ 24″, A. M. civil account, which is April 11th, by astronomical account; that is, by the Nautical Almanac, longitude by account 42° 50′ west of Greenwich, observed the distance of the sun and moon's nearest limbs 44° 36′ 42″. The observed altitude of the sun's lower limb 61° 11′. The observed altitude of the moon's upper limb 56° 50′, required the true longitude.

PREPARATIONS.

It is necessary to mention that the astronomical day begins at noon on the civil day, and continues twenty-four hours; so that in the place of calling it one o'clock in the morning by the astronomical account, it is called thirteen hours. Therefore 10^h 10′ 24″ A. M. on the 12th of April, by civil account, will be 22^h 10′ 24″ astronomical account.

April 11th, astronomical account,	22^h	10′	24″
Longitude in time,	2	51	20
	25	01	44
	24	00	00
Subtract 24 hours from it; it leaves	1	1	44

April 12th, astronomical account, the following day. So that the moon's semi-diameter and horizontal parallax must be taken out on the twelfth, between noon and midnight, astronomical acccount, the

Moon's semi-diameter at noon,	14′	57″
Do. do. at midnight,	14	54
The difference is 3″ in 12 hours, and the	00	3

reduced time is little more than one hour, the proportion in one-twelth part of three seconds, which is immaterial; so that the semi-diameter and horizontal parallax may be taken out for noon.

If the reduced time should be a quarter, half, one-third, two-thirds, three-fourths, the proportions to be taken and proportioned accordingly; or more brief by Table XI.

Moon's horizontal parallax at noon,	54′ 48″
Moon's horizontal parallax at midnight,	54 36
The difference in twelve hours,	00 12

The difference of twelve seconds in twelve hours being the time between noon and midnight, will equal one second to each hour, and the reduced time being nearly one hour, is one twelfth part of the time between noon and midnight. The moon's horizontal parallax is on the decrease, one second is subtracted from the horizontal parallax at noon, gives 54′ 47″.

The proportions may be found by saying, if twelve hours gives a given difference of semi-diameter or horizontal parallax, what will a given reduced time give; or by use of Table XI.

When the error of the watch is found, for giving the apparent time, for the purpose of finding the longitude by lunar observation, the lunar observation will give the longitude at the time when the error of the watch was found.

EXAMPLE I.

Observed distance,	44° 36′ 42″	—Sun's observed Altitude,	61° 11′	—Moon's observed upper limb,	56° 50′
			12		20
Sun's semi-diameter,	15 58	Sun's apparent altitude,	61 23	Moon's apparent altitude,	56 30
Moon's semi-diameter,	14 57				
Moon's augmentation,	13				
			Horizontal parallax,		54′ 47″
Apparent distance,	45° 07′ 50″				

Example for clearing the distance.

	° ′						
Apparent dist.	45 08	Sine,	9.8504	Same,	9.8504	Apparent distance,	45 7 50
Moon's app. alt.	56 30	Half sum, 81 30 secant,	0.8303	Same,	0.8303	First correction,	7 42
Sun's app. alt.	61 23	First rem. 20.07 co-sec.	0.4635	2d. rem. 25.00 co-sec.	0.3740	Cor. sun's altitude,	26
		Log. from Table I.	0.2249	Log. from Table III.	1.9806		
Sum,	163 01						45 15 58
Half sum,	81 30	First cor. 7′ 42″ pr. log.	1.3691	2d. cor. 0′ 10″ pr. log.	3.0353	Second cor. 0′ 10″	29 48
Sun's app. alt.	61 23					Moon's cor. 29 38	
First remainder,	20 7					Corrected distance,	44 46 10
Half sum,	81 30					The third correction,	4
Moon's app. alt.	56 30						
Second rem.	25 00					The True distance,	44 46 14

To find the Longitude.

True distance,	44° 46′ 14″	Diff. 0′ 29′ 07″ prop. log.	7911
N. A. dist. at noon,	45 15 21		
N. A. dist. at 3^h.	43 51 51	Diff. 1 23 30 prop. log.	3336
		1^h 2′ 46″, prop. log.	4575
Time over first distance,		12	
Time at Greenwich,		13 2 46	
Time at ship,		10 10 24	
Longitude in time,		2 52 22	Long. 43° 5′ 30″

See Table XII. for converting time to longitude, and Table XIII. for reducing longitude to time; see also the Nautical Almanac for the year 1817, at the end of the tables, to suit the examples in this book.

The time over the first distance is twelve hours, which, added to one hour, two minutes, and forty-six seconds, makes thirteen hours, two minutes, and forty-six seconds, the time at Greenwich. Time at ship is ten hours, ten minutes, and twenty-four seconds, which, subtracted from thirteen hours, two minutes, and forty-six seconds, makes the difference two hours fifty-two minutes, and twenty-two seconds. It can also be done as follows: twenty-four hours can be added to one hour, two minutes, and forty-six seconds, which will be 25^h 2′ 46″

Then the time at ship call 22 10 24

The difference is longitude in time, as before 2 52 22 longitude, 43° 5′ 30″

On the 22d of April 1817, 0^h 16′ 15″, astronomical account, which is also the 22d of April by civil account, observed the distance of the sun and moon's nearest limbs, 66° 59′ 18″. Sun's observed altitude, lower limb, 81° 36′, the observed altitude of the moon's upper limb 29° 26′; longitude by account 55° 20′ west of Greenwich.

22d of April by the Nautical Almanac,	0^h 16′ 15″
Longitude in time,	3 41 20
Reduced time, or estimated time at Greenwich,	3 57 35

In this case the moon's semi-diameter is taken out between noon and midnight on the 22d of April, 1817, astronomical time.

Moon's semi diameter at noon,	15′ 9″
Ditto at midnight,	15 14
The difference is	5

The reduced time is four hours, which is the third of twelve hours, the time between noon and midnight in the Nautical Almanac; and the third of five seconds is as near as possible two seconds, which is to be added to the semi-diameter at noon, as the semidiameter is increasing, which makes the semi-diameter fifteen minutes and eleven seconds.

The moon's horizontal parallax at noon,	55′ 30″
Do. at midnight,	55 49
The difference in twelve hours,	19

Proportional part is six seconds, and as the horizontal parallax is increasing, it is added to 55 30, which is 55 36, the horizontal parallax at reduced time.

EXAMPLE II.

Observed distance,	66° 59′ 18″—Sun's lower limb,		81° 36′—Moon's observed upper limb,		29° 26′
Index error,	7	add	12	substract	20
	66 59 11	Sun's apparent altitude,	81 48	Moon's apparent altitude,	29 06
Sun's semi-diameter,	15 55				
Moon's semi-diameter,	15 11		Horizontal parallax	55′ 36″	
Moon's augmentation,	7				
Apparent distance,	67 30 24				

To find the true Distance.

	° ′						° ′ ″
Apparent dist.	67 30	Sine,	9.9656	Same,	9.9656	Apparent distance,	67 30 24
Moon's app. alt.	29 6	Half sum, 89 12, secant,	1.8550	Same,	1.8550	First correction,	13
Sun's appar. alt.	81 48	First rem., 7.24, co-sec.	0.8901	2d rem. 60 6, co-sec.	0.0620	Sun's correction,	5
		Log. from Table I.	0.2246	Log. from Table III.	2.0444		
Sum,	178 24						67 30 42
Half sum,	89 12	First cor. 0′ 13″ pr log.	2.9353	2d cor. 0′ 2″ pr. log.	3.9270	Second cor. 2″	46 57
Sun's app. alt.	81 48					Moon's cor. 46 55	
First remainder,	7 24					The true distance,	66 43 45
	89 12					No third correction.	
Moon's ap. alt.	29 6						
Second rem.	60 6						

To Find the Longitude.

True distance, 66 43′ 45″	diff.	0 28 23	prop log.	8022
Dist. N. A. 3h 66 15 22	diff.	1 26 8	prop. log.	3201
Dist. N. A. 6 67 41 30				
		0h 59 19		0.4821
Add the time over the first distance,		3		
The time at Greenwich,		3 59 19		
Time at ship,		16 15		

Longitude in time, 3h 43′ 4″, equal to longitude 55° 46′ west.

The time by the above observation was too near noon to obtain the apparent time by the sun's altitude taken at the time of observing the distance; so that the error of the watch was found in the morning, and the time brought forward to the time of observation.

In my practice I made it a rule, a few minutes before I measured the distance, to get an altitude of the sun, for the purpose of obtaining the apparent time, by which I found the error of the watch. This time I compared with the time obtained by the altitude taken by the quadrant, at the time of observing the distance. When they agree, or nearly so, the altitude by the quadrant is right.

This method is more particularly useful in a high sea, as the altitude taken by the quadrant may answer for clearing the distance; but not so well for obtaining the apparent time. An altitude by the sextant has the advantage of being taken more leisurely, and with greater exactness than that by the quadrant.

Lunar observation taken on the 23d of April 1817, 0h 13′ 9″, astronomical account,* the sun and moon's nearest limbs were observed 78° 39′ 50″, the observed altitude of the sun's lower limb 82° 27′ and the observed altitude of the moon's upper limb 16° 50′, and longitude by account 55° 40′ west of Greenwich. Required the true longitude.

* It is perplexing to young lunarians that the nautical or sea day, is not the same as the astronomical day, because the Nautical Almanac and all the tables in general use are computed for the astronomical time. As the security of navigation depends upon astronomy, it certainly would be of utility to reject the sea day, and make nautical time conform to astronomical time.

PREPARATIONS.

Time at ship,	0h 13′ 9″	
Longitude in time,	3 42 40	
Reduced time,	3 55 49	
Moon's semi-diameter at noon,		15′ 20″
Moon's semi-diameter at midnight,		15 26
Difference in twelve hours,		6
Moon's horizontal parallax at noon,		56′ 10″
Moon's horizontal parallax at midnight,		56 33
Difference in twelve hours,		23

See Table XI.

The reduced time being nearly four hours, which is the third of twelve hours, the proportions may be allowed agreeably to that.

Then say one-third of six seconds is two seconds of the moon's semi-diameter, and being on the increase gives the moon's semi-diameter fifteen minutes and twenty-two seconds; and the third of twenty-three seconds of the moon's horizontal parallax is eight seconds nearly, which is on the increase. Add eight seconds, and it gives fifty-six minutes and eighteen seconds for the moon's horizontal parallax.

EXAMPLE III.

Observed distance,	78° 39′ 50″	—Sun's observed altitude,	82′ 27′	—Moon's observed upper limb,	16′ 50″
Sun's semi-diameter,	15 55	add	12	subtract	20
Moon's semi-diameter,	15 22				
Moon's augmentation,	4	Sun's apparent altitude,	82 39	Moon's apparent altitude,	16 30
Apparent distance,	79 11 11			Horizontal parallax, 56′ 18″	

To find the true Distance.

	° ′						° ′ ″
Apparent dist.	79 11	Sine,	9.9922	Same,	9.9922	Apparent distance,	79 11 11
Moon's app. alt.	16 30	Half sum, 89 10, secant,	1.8373	Same,	1.8373	First correction,	10
Sun's app. alt.	82 39	First rem. 6 31, co-sec.	0.9450	2d rem. 72 40, co-sec.	0.0201	Sun's correction,	4
		Log. from Table I.	0.2300	Log. from Table III.	2.0451		
Sum,	178 20						79 11 25
Half sum,	89 10	First cor. 10″ prop. log.	3.0045	2d cor. 2″ prop. log.	3.8947	Second cor. 2″	50 50
Sun's app. alt.	82 39					Moon's cor. 50 48	
First remainder,	6 31					Corrected distance,	78 20 35
Half sum,	89 10						
Moon's app. alt.	16 30						
Second rem.	72 40						

Which in this observation is the true distance, having no third correction.

To find the Longitude.

True distance,	78° 20′ 35″	diff. 0 28 31	prop. log. 8002
Dist. N. A. 3^h,	77 52 4	diff. 1 28 24	prop. log. 3088
Dist. N. A. 6^h	79 20 28		
		0 58 4	prop. log. 4914
Time in Naut. Almanac, first dist.		3	
Time at Greenwich,		3 58 4	
Time at ship,		0 13 9	
The difference in time,		3 44 55	

Equal to longitude fifty-six degrees, thirteen minutes and forty-five seconds, west.

The following sets were taken on board the ship Mount Vernon, from Marseilles towards Havanna, on the 25th day of April, 1817. The nearest limbs of the moon and star Pollux. Longitude by account, fifty-nine degrees thirty minutes.

	Time per watch.	Observed dist. star's N. limb.	Star's observed altitude.	Moon's obs'd alt. lower limb.
	13 6 30	31 21 00	43 07 00	72 44 00
	13 12 50	31 24 00	41 46 00	71 20 00
	13 17 30	31 26 00	40 43 00	70 29 00
	39 36 50	94 11 00	125 36 00	214 33 00
Time per watch,	13 12 17	31 23 40	41 52 00	71 31 00
Watch fast,	4 22 1	16 11	00 04 00	12 00
Ap. time at ship,	8 50 16	31 39 51	41 48 00	71 43 00

Time at ship,	8 50 16	
Long. 59° 30′ W. in time,	3 58 00	
After midnight,	12 48 16	
Moon's semi-diameter, April 25th at midnight,		15′ 54″
Moon's semi-diameter, April 26th at noon,		16 2
Difference in twelve hours,		8″
By Table XI. difference for 48′,		1
Carried over,		15 55

Brought over,		15 55
Moon's augmentation, Table VIII.	add	16
True semi-diameter,		16 11
Moon's horizontal parallax, 25th, at midnight,		58′ 18″
Moon's horizontal parallax, 26th, at noon,		58 45
Difference in twelve hours,		27
By Table XI. difference for forty-eight minutes,		2
Moon's horizontal parallax,		58 20

As the nearest limbs of the moon and the star Pollux were taken, the moon's semi-diameter is added to the observed distance, and four minutes subtracted from the star's observed altitude for dip, and as the moon's lower limb was observed, twelve minutes is added for difference between the dip and semi-diameter.

EXAMPLE IV.

To find the true Distance.

	° '						° ' "
Apparent dist.	31 40	Sine,	9.7201	Same,	9.7201	Apparent distance,	31 39 51
Moon's app. alt.	71 43	Half sum, 72° 35', secant,	0.5238	Same,	0.5238	First correction,	33 28
Star's app. alt.	41 48	First rem. 30 47, co-sec.	0.2909	2d rem. 0° 52', co-sec.	1.8202	Star's correction,	1 3
		Log. from Table I.	0.1958	Log. from Table II.	1.7990		
Sum,	145 11						32 14 22
		First cor. 33' 28" p. log.	0.7306	2d cor. 0' 2", pr. log.	3.8631	Moon's cor. 17' 58"	18 00
Half sum,	72 35					Second cor. 2	
Star's app. alt.	41 48						31 56 22
First remainder,	30 47					Third correction,	1
Half sum,	72 35					True distance,	31 56 23
Moon's app. alt.	71 43						
Second rem.	0 52						

10

To find the Longitude.

True distance,	31° 56' 23"	difference,	0° 27' 28"	proportional logarithm,	8165
Distance by N. A. 12 hours,	31 28 55	difference,	1 42 28	ditto ditto,	2447
Dist. by N. A. 15 hours,	33 11 23		0 48 15	prop. log.	5718
			12 00 00		
		Time at Greenwich,	12 48 15		
		Time at ship,	8 50 16		
		Longitude in time,	3 57 59	Longitude,	59° 29' 45"

Observed distance of the moon and Spica's furthest limbs, on the 26th of April, 1817, in longitude by account sixty-one degrees forty minutes west of Greenwich, as follows:

	Time per watch.	Obs'd dist. star & moon's F. L.	Star's observ'd altitude.	Moon's obs'd alt. upper limb.
	12 20 00	45 41 00	34 25 00	79 00 00
	12 25 30	45 38 10	35 37 00	80 00 00
	12 29 00	45 36 45	36 22 00	80 50 00
	00 74 30	0 115 55	106 24 00	239 50 00
Time per watch,	12 24 50	45 38 38	35 28 00	79 57 00
Watch too fast,	4 32 48	S.D. 16 26	4 00	00 20 00
Apparent time,	7 52 02	45 22 12	35 24 00	79 37 00

Time at ship,	7^h 52′ 02″
Longitude in time,	4 06 40
Near midnight,	11 58 42
Horizontal parallax, at midnight,	59 12
Moon's semi-diameter at midnight,	16 10
Moon's augmentation,	16
Moon's semi-diameter at reduced time,	16 26

☞ Correction of the star's altitude is found in Table IV.
Correction of the sun's altitude is found in Table V.
Correction of the moon's altitude is found in Table VI.
Third correction is found in Table VII.
Logarithmic sines, tangents, and secants, are found in the epitomes of navigation.

See Rule, page 57. See Rule for taking out the logarithms and corrections. See pages 58, 59, 60, 61.

EXAMPLE V.

To find the true Distance.

	° ′						° ′ ″
Apparent dist.	45 22	Sine,	9.8522	Same,	9.8522	Apparent distance,	45 22 12
Moon's app. alt.	79 37	Half sum, 80 11, secant,	0.7682	Same,	0.7682	First correction,	19 40
Star's app. alt.	35 24	First rem. 44 47, co-sec.	0.1521	2d rem. 34′, co-secant,	2.0048	Star's correction	1 21
		Log. from Table I.	0.1890	Log. from Table II.	1.7415		
Sum,	160 23						45 43 13
Half sum,	80 11	First cor. 19 40, pr. log.	0.9615	2d corr. 0′ 1″ pr. log.	4.3667	Second cor. 0′ 1″	10 32
Star's app. alt.	35 24					Moon's cor. 10 31	
First remainder,	44 47						45 32 41
						Third correction,	1
Half sum,	80 11						
Moon's app. alt.	79 37					True distance,	45 32 42
Second rem.	34						

To find the Longitude.

True distance,	45° 32′ 42″	—Difference,	0° 0′ 07	—Proportional logarithm,	3.1883
Distance from N. Al. at 12h	45 32 49	Difference,	1 45 21	Proportional logarithm,	2326
Distance from N. Al. at 15h	43 47 28				
			0 0 12	Proportional logarithm,	2.9557
			12		
		Time at Greenwich,	12 0 12		
		Time at ship,	7 52 2		
		Longitude in time,	4 8 10,	equal to longitude 62° 2′ 30″ west.	

Suppose that on the 29th of April, 1817, at six hours astronomical account, in longitude 45° east, by account, the observed distance of the nearest limb of the moon from the star Antares, was 52° 39′ 50″, the observed altitude of the star 29° 2′ and the observed altitude of the moon's lower limb 40° 50′. Required the true longitude.

EXAMPLE VI.

Star's observed altitude	29°	2′	—Moon's observed alt.	40°	50′
Dip, subtract		4	add		12
Star's apparent altitude,	28	58	—Moon's app. alt.	41	02

Time at ship,	6 hours astronomical account.
Longitude 45° east, in time,	3 hours.
	3 hours.

The moon's semi-diameter and horizontal parallax must be taken out of page VII. of the month of the Nautical Almanac, between noon and midnight on the 29th of April.

	′	″		°	″
Moon's s. d. on the 29th at noon,	16	39	hor. par. noon,	61	1
Moon's s. d. at midnight,	16	42	hor. par. mid.	61	12
Difference in twelve hours,		3	diff. in 12 hrs.		11
Diff. in three hours by Table XI.		1	diff. in 3^h T. XI.		3
	16	40	hor. parallax,	61	4
Augmentation of moon's se. dim.		12			
	16	52			

EXAMPLE VI.

To find the true Distance.

	°	′	″
Observed dis.	52	39	50
Moon's S,D.		16	52
	52	56	42
Index error,			42
Apparent dis.	52	56	00
☽'s app. alt.	41	2	
Star's ap. alt.	28	58	
Sum,	122	56	
Half sum,	61	28	
Star's ap. alt.	28	58	
First rem.	32	30	
Half sum,	61	28	
☽'s app. alt.	41	2	
Second rem.	20	26	

Sine,	9.9019	Same,	9.9019
Half sum, 61 28 secant,	0.3208	Same,	0.3208
First rem. 32.30 co-sec.	0.2697	2d rem. 20.26 co-sec.	0.4570
Table I. logarithm,	0.1786	Table II. logarithm,	1.6635
First cor. 38′ 23″ pr. log.	0.6710	2d cor. 0′ 49″ pr. log.	2.3432

	°	′	″
Apparent distance,	52	56	0
First correction,		38	23
Star's correction,		1	42
	53	36	05
Moon's cor. 44′ 59″ / Second cor. 49		45	48
	52	50	17
Third correction, add			11
True distance,	52	50	28

To find the Longitude.

	° ′ ″		
True distance,	52 50 28		
Dis. by Naut. Alm. at 3 hours,	52 55 42		
	00 05 14	prop. log.	1.5365
Dis. by Naut. Alm. in 3 hours,	52 55 42		
Dis. by Naut. Alm. in 6 hours,	51 2 38		
Difference,	1 53 04	prop. log.	2019
	0h 8′ 20	prop. log.	1.3346
Time over 1st dis. N. A. add	3		
Time at Greenwich,	3 8 20		
Time at ship,	6 00 00		

Longitude in time, 2 51 40 which reduced into longitude at the rate of one hour to fifteen degrees, four minutes to one degree, and four seconds to one mile; or more briefly by Table XII. Longitude in 42° 55′ 00″ east.

Suppose on the 7th of April, 1817, at two hours astronomical account, in longitude 54° east, by account, the observed distance of the sun and moon's nearest limbs was 105° 16′ 20″, the observed altitude of the sun's lower limb 42° 3′, and the observed altitude of the moon's lower limb 26° 4′.

Required the true longitude.

Sun's obs. alt.	42° 3′	—observed alt. moon's lower limb,	26° 4′
add	12	add	12
Sun's app. alt.	42 15	Moon's apparent altitude,	26 16

EXAMPLE VII.

April 7th, astronomical account, 2 hours.	
add	24
	26 00
Longitude 54° east, in time,	3 36

April 6th, astronomical account, 22h 24′, or 10h 24′, A. M. on the 7th, civil account. The reduced time being 10h 24′ from midnight on the 6th of April, by the Nautical Almanac, the

moon's semi-diameter and horizontal parallax is taken out for midnight on the 6th, and noon on the 7th of April, as follows.

Moon's semi-diameter at midnight, on the sixth,	16′	2″
Moon's semi-diameter at noon on the seventh,	15	55
Difference in twelve hours,		7
Difference in 10^h 24′ by Table XI.		6
	15	56
Augmentation moon's S.D. Table VIII.		7
Moon's true semi-diameter,	16	03
Moon's horizontal parallax, sixth, at midnight,	58	45
Moon's horizontal parallax, seventh, at noon,	58	18
Difference in twelve hours,		27
Difference in 10^h 24′ by Table XI.		23
Moon's horizontal parallax,	58	22

EXAMPLE VII.

Observed distance,		105°	16′	20″
Moon's semi-diameter,			16	3
Sun's semi-diameter,			15	59
		105	48	22
Index error,	add			31
Apparent distance,		105	48	53

To find the true Distance.

	°	′								
Apparent dist.	105	49	Sine,	9.9832	Same,	9.9832	Apparent distance,	105	48	53
Moon's app. alt.	26	16	Half sum, 87° 10′ sec.	1.3060	Same,	1.3060	First correction,	add 4		5
Sun's app. alt.	42	15	First rem. 44.55 co-sec.	0.1511	2d. rem. 60.54 co-sec.	0.0586	Sun's correction,		0	56
			Log. from Table I.	2043	Log. from Table III.	1.8500				
Sum,	174	20						105	53	54
			First cor. 4′ 5″ pr. log.	1.6446	Second cor. 0′ 7″ p. l.	3.1978				
Half sum,	87	10			Moon's cor. 50 26					
Sun's app. alt.	42	15								
					50 33					
First remainder,	44	55							50	33
Half sum,	87	10						105	3	21
Moon's app. alt.	26	16					The third correction,			1
Second rem.	60	54					The True distance,	105	3	20

To find the Longitude.

	° ′ ″		
True distance,	105 3 20		
By Naut. Alm. distance at 21^h,	105 49 13		
By Naut. Alm. dist. at noon, 7th,	104 13 56		
	00 45 53	diff. p. log.	5936
	1 35 17	diff. p. log.	2763
	1 26 42		3173
Time over first distance, N. A.	21		
	22 26 42		
	26 00 00		
Longitude in time,	3^h 33′ 18″	by Table XII.	

53 19 30 east longitude.

On finding the Longitude by Chronometer.

Suppose the chronometer set to the meridian of Greenwich, and it should keep time regular, and if not, the rate or difference must be ascertained before the ship sails; a chronometer set thus to Greenwich time, say at Cape Henlopen, in longitude 75° west of Greenwich; when it is mean noon at Cape Henlopen, by chronometer, it will be five hours past noon, because the sun will be on the meridian of Greenwich earlier than at Cape Henlopen, of course they will have their noon first. A ship starting from Cape Henlopen with the chronometer set thus, after she has sailed east 15°, when it is mean noon at ship, it will be four hours afternoon by chronometer; and after she has sailed east 30°, when it is noon mean time at ship, it will be three hours afternoon by the chronometer, and when she is on the meridian of Greenwich, the ship's time and chronometer will agree, and after the ship has passed 15° east of the meridian of Greenwich, by the chronometer, it will be 11 o'clock in the forenoon when it is 12 o'clock, or noon, by ship's account. Now the time at ship is greater than Greenwich time, because the ship has the sun on the meridian before it is on the meridian of Greenwich.

Rule to take the Equation of time out of the Nautical Almanac, for any given place.

RULE.

Turn the longitude of the place into time, and add it to the time at ship, or given place, if the longitude be west; but subtract it from that time, if the longitude be east, and it will give the time at Greenwich.

Take the equation from page II, of the month in the Nautical Almanac, for the noon preceding the time when it was wanted, and also the difference between it and the equation for the day following; and say, as twenty-four hours is to this difference, so is the time at Greenwich to a fourth number, which must be added to, or subtracted from the equation for the preceding noon, according as the equation is increasing or decreasing.

Required the equation, April 6th, 1817, in longitude 75° west, at four hours by Nautical Almanac.

EXAMPLE.

Time at ship,		4 hours.
Longitude 75° west in time,		5
Time at Greenwich,		9 hours.
Equation 6th of April, 1817, for noon,		2′ 30″ 8
As 24 hours is to 9 hours, so is 17.5 (daily diff.) to		6 6
Equation at reduced time,	add	2 24 2

Required the equation of time on the 25th of April, 1821, at six hours, by Nautical Almanac, in longitude by account, 30° east.

EXAMPLE.

Time at ship,		6 hours.
Longitude 30° east, in time,		2
Time at Greenwich,		4
Equation for noon, April 25th, Naut. Alm.		2′ 6″ 8
As 24 hours is to 4 hours, so is 10.7 (daily diff.) to		+ 1 8
Equation at reduced time,	subtractive,	2 8 6

Required the equation of time, April 29th, 1817, at two hours by Nautical Almanac, longitude 60° west.

EXAMPLE.

Time at ship,	2 hours.
Longitude 60° west, in time,	4
Time at Greenwich,	6 hours.
Equation, April 29th, 1817, by Naut. Alm.	2′ 46″ 5
As 24 hours is to 6 hours, so is 8.7 (daily diff.) to	+ 2 2
Equation at reduced time, subtractive,	2 48 7

Method of obtaining the Longitude by Chronometer.

Suppose on the 5th of April, 1817, at three hours forty minutes per watch, astronomical account, which is also three hours forty minutes on the 5th, afternoon by Nautical Almanac.

In latitude fifty-one degrees thirty minutes north, longitude sixty-five degrees west from Greenwich, the observed altitude of the sun's lower limb was twenty degrees forty minutes.

On the 20th of March the chronometer was one hour slow of Greenwich time, which call a constant error, to be added to the time by chronometer. If it had been fast of Greenwich time, this error would have been subtractive.

The chronometer has been gaining two seconds per day since the 20th of March. The eye was sixteen feet above the level of the sea, when the sun's altitude was obtained.

EXAMPLE I.

Sun's observed alt.	20° 40′ 00″	Sun's declination from Naut. Alm. N.	6° 2′ 50″
Sun's semi-diameter, from N. A. add	15 59	Cor. from Table XVI. 5th of April, 3h 40′	3 30
	20 55 59		6 6 20
Dip from Tab. IX. sub.	3 50	Cor. from Tab. XVI. for long. 65° W.	4 8
	20 52 09	Correct declination N.	6 10 28
Cor. sun's alt. Tab. V.	2 20		90 00 00
Sun's cor. alt.	20 49 49	Polar distance,	83 49 32

Sun's correct altitude,	20° 49′ 49″		
Latitude,	51 30 00	Secant,	0.20585
Polar distance,	83 49 32	Co-secant,	0.00252
Sum,	156 9 21		
Half sum,	78 4 40	Co-sine,	9.31509
	20 49 49		
Remainder,	57 14 51	Sine,	9.92482
		Angle,	19.44828
Half sum, equal sine of 31° 59′ 39″,		half angle,	9.72414
Angle doubled,	2		

Hour angle, 63 59 18, reduced to time, at the rate of fifteen degrees for an hour, or more briefly by Table XIII. equal to four hours, fifteen minutes, and fifty-seven seconds. When the sun's altitude is observed in the afternoon, and when finding the time by the above method, the sine of the half sum of the four logarithms must be found in the tables; and if the sun's altitude be observed in the forenoon, the co-sine of half the sum of the four logarithms must be found in the tables, and the corresponding degrees, minutes, and seconds taken out and reduced to time by the above precepts.

See rule for finding the time in the Epitome of Navigation. When the degrees exceed ninety, subtract from one hundred and eighty, and when they exceed one hundred and eighty, subtract from three hundred and sixty degrees.

In Bowditch's American Practical Navigator, the hour angle is already given in the left side column in the tables of logarithmic sines, tangents, and secants, and the complements and supplements of the degrees in those tables are also given, which makes that book very convenient.

The apparent time may be obtained by the logarithm of rising, examples for which are given in most of the epitomes of navigation.

The above logarithms are taken out to the nearest minute, except the logarithmic co-sine of the half sum, which I proportion to odd seconds. If this be neglected it will occasion a small error in the apparent time, particularly when the half sum is great.

In those books where the logarithmic sines, tangents, and secants are marked above ninety degrees at the bottom of the page, the degrees must be taken from the bottom, and the minutes from the top in the left side column, that is when above

ninety degrees, which agrees with the supplement. Suppose the logarithm of ninety-five degrees twenty minutes be required.

	180° 00′
	95 20
Supplement,	84 40

I mention this as a caution, as I have seen many mistakes made by beginners.

To find the Longitude by Chronometer.

Time at ship,	$4^h\ 15'\ 57''$	
Longitude 65 degrees West in time,	4 20 00	
Add in west longitude, reduced time,	8 35 57	
Equation on the 5th of April, 1817, N. A.		2′ 48.5
As 24^h is to $8^h\ 35'\ 54''$ so is 17.7 (daily difference) to —		6.3
Equation for reduced time,		2 42.2
Apparent time,	4 15 57	
Equation, add	2 42	
Mean time,	4 18 39	

Time shown by chronometer,	7° 40′ 42″
Constant error, add	1 00 00
	8 40 42
Rate of 2″ gain for 16 days,	32
Time at Greenwich,	8 40 10
Mean time at ship,	4 18 39
Longitude in time,	4 21 31

At the rate of fifteen degrees for an hour, one degree for four minutes, four seconds for one mile; or more briefly, by Table XII. longitude in, sixty-five degrees, twenty-two minutes, and forty-five seconds west; because the Greenwich time is the greatest.

N. B. When the time is found by using the zenith distance, in the place of the altitude, the logarithmic co-secant of the complement of latitude, the logarithmic co-secant of the polar distance, and the logarithmic sine of the half sum are used; and when the zenith distance is taken from the half sum, to get the remainder, and the logarithmic sine of the remainder be used, the logarithmic co-sine of the half sum of the four logarithms must be found in the table for finding the half hour angle, in the place of the sine.

For logarithmic sines, and secants, and proportional logarithms, I refer you to the epitomes of navigation.

Remark.—In short runs it is better to go by the difference of longitude made by chronometer, in place of attending to the longitude from Greenwich; for the cross bearings and distances of places from each other, in many instances, agree by the chart, when their longitude may be in some degree incorrect.

The corrections in the foregoing example are applied minutely, to show their use and meaning; but this exactness is not requisite, unless it be for the purpose of rating a chronometer, in which case the logarithms also must be proportioned. In other cases the difference between the semi-diameter and dip, which is twelve, may be added, as in example second.

Suppose on the 25th of April, 1817, at twenty hours, twenty minutes, and ten seconds, per watch, astronomical account, which is eight hours, twenty minutes, ten seconds A. M. on the 26th, by civil account, latitude forty degrees forty minutes south, longitude forty-five degrees east of Greenwich by account, the observed altitude of the sun's lower limb was seventeen degrees five minutes.

EXAMPLE II.

Sun's observed alt.		17° 5′ 00″
	add	12 00
		17 17 00
Sun's corr. fr. T. V.		2 53
Sun's cor. altitude,		17 14 07

Sun's delnication, N. on the 26th April, 1817, Naut. Al.	13° 29′ 21″
Correction from Table XVI. 3h 39′ 50″ bef. noon on the 26th, sub.	3 2
	13 26 19
Correc. from Table XVI. for long. 45° E.	2 29
Correct declination, north,	13 23 50
	9 00 00
Polar distance,	103 23 50

Sun's altitude	17° 14′ 07″		
Latitude,	40 40 00	Secant,	0.12004
Polar distance,	103 23 50	Co-secant,	0.01199
Sum,	161 17 57		
Half sum,	80 38 58	Co-sine,	9.21076
Sun's altitude	17 14 07		
Remainder,	63 24 51	Sine,	9.95148
			19.29427
			9.64713

Half sum, equal co-sine 63 39 26, half hour angle,
2

Hour angle, 127° 18′ 52″, which, reduced to time, by allowing fifteen degrees for an hour; more briefly by Table XIII. which is 8h 29′ 15″ A. M.

The correction of the sun's altitude, Table V. is the difference between its refraction and parallax in altitude.

On the Planets.

THE planets Jupiter, Mars, and Saturn, are very serviceable for obtaining the latitude. The planets are easily distinguished from the fixed stars by their steady light, as they never, like the latter, twinkle, except when very near the horizon. Mars may be known by his ruddy complexion; Jupiter commonly appearing large and refulgent. Saturn is of a pale cast and feeble light, sometimes resembling a star of the first or second magnitudes. Their declinations, and time of their passing the meridian of Greenwich is given in the Nautical Almanac in page V. of the month, for every six days, and may be proportioned to any intermediate time.

No dependance must be put in the altitude of either stars or planets without a distinct horizon. These planets, given in the Nautical Almanac, and the fixed stars given in the epitomes of navigation, and the moon, may be of the greatest importance for ascertaining the latitude from their meridian altitudes, as in high latitudes it is frequently hazy in the day-time, and clear at night. About the Cape Verd islands, being frequently hazy in the day, and clear at night, the use of the above planets for finding the latitude by their meridian altitude may be of material service. In the ship Recovery of Philadelphia, in 1815, being bound to the Cape Verd islands, when drawing up with them, I was for several days, by the haze, prevented from obtaining the sun on the meridian; but at night, it being clear, I obtained the latitude by the planet Mars; and I ran down the latitude of the Isle of May with the latitude obtained by the meridian altitude of the above planet, and made it as I wished.

See rules for finding the latitude by the meridian altitude of a planet in Bowditch's American Practical Navigator.

To find the Longitude by an Eclipse of the Moon.

AT the times when the eclipse begins and ends at Greenwich,* observe times when it begins and ends at any other

* The time of the eclipses of the moon on the meridian of Greenwich is given in the Nautical Almanac.

place. The difference of these times, converted into longitude, will give the longitude of the ship or place.

For the above purpose a watch should be previously regulated by the sun's altitude, or the error found and allowed for.

An eclipse of the moon, arising from its real deprivation of light, must appear to begin at the same instant to every place on that part of the earth which is turned towards the moon. The moon enters the penumbra of the earth before it comes to the umbra, and therefore it gradually loses its light, and the penumbra is so dark at the beginning of the umbra, that it is difficult to ascertain the exact time when the moon's limb touches the umbra, or when the eclipse begins.

When I observed an eclipse of the moon, for the purpose of obtaining the longitude, as I could not distinguish between the penumbra and umbra, therefore, when the faint shadow or penumbra first touched the moon's limb, I allowed thirty seconds to sixty seconds of time, according to my judgment, before I marked the time. This destroyed a part of the error. In this way the longitude may be obtained, within from fifteen to sixty miles.

The penumbra is a faint or partial shadow, observed between the perfect shadow and the full light, in an eclipse; and this degree of light and shadow will be greater or less as the point lies open to a greater or less part of the sun's body.

On Quadrants.

QUADRANTS should have three screens (glasses behind the horizon glass) such as are fixed to a sextant. They will be found useful in taking the sun's altitude when low, to take his glare off the horizon, also when taking an altitude of the sun for the purpose of obtaining the apparent time, or for obtaining an azimuth, or if the time should be wanting on shore. The sun's altitude may be observed in an artificial horizon of quicksilver, tar, or molasses, or in a bucket or basin of water; and the index error may also be obtained by having these three additional glasses; otherwise not.

In high latitudes, when observing the altitude of sun or star, to ascertain the apparent time, it is necessary to have the latitude correct, particularly if the latitude and declination are of contrary names; that is, if the one be north and the other south; as a small error in the latitude will make a considerable error in

the apparent time. When it is suspected that there is much error in the latitude, it is best, after you have worked for the apparent time, to work for it again in one degree different from the former. By this means you will know how much you can depend on the apparent time. It is best to observe the altitude of the object when it is in the prime vertical, that is when it bears due east or due west; but if the declination of the object should be of a contrary name to the latitude of the ship, it cannot appear in the prime vertical. In this case the altitude should be observed as near the horizon as possible, but not less than three degrees high, on account of the variation of refraction.

See Table XV.

On Marking a Log-line.

SIX thousand feet being one sea mile, the sixtieth part of which is one hundred feet; and one minute being the sixtieth part of an hour, it follows, that if a log-line were marked at one hundred feet to the knot, that the glass should be one minute long. As, if a ship goes one hundred feet in a minute, she will go six thousand feet in an hour. But the usual way now is, to mark the line forty-eight feet to the knot, and to make use of a twenty-eight second glass.

On the Importance of having a good Watch.

A GOOD watch is of great service on board of a ship at sea. In cloudy weather, when the sun is occasionally seen, frequently only a single sight of his altitude can be obtained. He being immediately obscured by clouds after this observation, it cannot be known by it, whether he is on the meridian or not; and therefore the observation is rejected. But, if you have a good watch, which has been previously regulated by an observation of the sun's altitude, taken at a time when he was at least three hours from the meridian, it will show the apparent time; and you may thereby know how far your observation may be depended on.

In the case, also, where an observation of the sun cannot be obtained when he is on the meridian, from the interception of clouds, but is taken a little time before or after meridian, a watch, thus regulated, is also very useful. With respect to this the

method which I adopted is the following:—On a clear day I observed the sun five, ten, fifteen, and twenty minutes before or after he came on the meridian, as well as at meridian, and noted down the difference between the altitude at these times and the meridian altitude. When, therefore, I could not get an observation when the sun was on the meridian, but observed him within any of the times above noticed, I allowed the differences which I had previously observed these times made in the altitude, compared with the meridian altitude.

It must be observed, however, that this will answer only in high latitudes.

On the Precession of the Equinoxes.

THE precession of the equinoxes has been already mentioned; the cause of which I shall here mention according to Mr. Ferguson. Here the length of the solar year differs a little from Mr. Gregory.

By the earth's motion on its axis, there is more matter accumulated all around the equatorial parts than any where else on the earth.

The sun and moon, by attracting this redundancy of matter, bring the equator sooner under them in every return towards it, than if there was no such accumulation. Therefore, if the sun sets out as from any star or other fixed point in the heavens, the moment when he is departing from the equinoctial or from either tropic, he will come to the same equinox or tropic again twenty minutes seventeen and a half seconds of time, or fifty seconds of a degree, before he completes his course, so as to arrive at the same fixed star or point from whence he set out. For the equinoctial points recede fifty seconds of a degree westward every year, contrary to the sun's annual progressive motion.

When the sun arrives at the same equinoctial or solstitial point, he finishes what we call the tropical year, which, by observation is found to contain three hundred and sixty-five days, five hours, forty-eight minutes, fifty-seven seconds; and when he arrives at the same fixed star again, as seen from the earth, he completes the sideral year, which contains three hundred and sixty-five days, six hours, nine minutes, fourteen seconds and a half. The sideral year is therefore twenty minutes seventeen seconds and a half longer than the solar or tropical year, and nine minutes fourteen seconds and a half longer than the Julian or civil year, which we state at three hundred and sixty-five days six

hours; so that the civil year is almost a mean betwixt the sideral and tropical.

As the sun describes the whole ecliptic, or three hundred and sixty degrees in a tropical year, he moves fifty-nine minutes and eight seconds of a degree every day at a mean rate, and consequently fifty seconds of a degree in twenty minutes seventeen and a half seconds of time: therefore he will arrive at the same equinox or solstice when he is fifty seconds of a degree short of the same star or fixed point in the heavens, from which he set out in the year before. So that with respect to the fixed stars, the sun and equinoctial points fall back, as it were, thirty degrees in two thousand, one hundred and sixty years, which will make the stars appear to have gone thirty degrees forward with respect to the signs of the ecliptic in that time; for the same signs always keep in the same points of the ecliptic, without regard to the constellations.

On the Diminution of the Obliquity of the Ecliptic.

THE obliquity of the ecliptic to the equator was long considered as a constant quantity; and even so late as the end of the seventeenth century, the difference between the obliquity, as determined by ancient and modern astronomers, was generally attributed to inaccuracy of observation, and to a want of knowledge of the parallaxes and refraction of the heavenly bodies. It appears, however, from the most accurate modern observations, made at great intervals, that the obliquity of the ecliptic is diminishing; and the theory of universal gravitation fortunately supplies us with a satisfactory explanation of the phenomenon.

While the earth is revolving in the plane of the ecliptic, it is acted upon by all the planets of the solar system. The action of any of the planets, when they are situated in the plane of the ecliptic, have a tendency only to alter the earth's gravity to the sun, or to accelerate and retard its motion; but as all the planets move in orbits inclined to the ecliptic, their action upon the earth tends to bring the earth towards the plane of their orbits, in the manner which we have already explained, when treating of the precession of the equinoxes. The effect of this action, therefore, is to displace the ecliptic, or diminish the inclination of the earth's orbit to the plane of the orbit of the planet; but while the earth's orbit is thus changing its position, the equator of the earth is sustaining no change, and consequently there will be a variation in the obliquity of the ecliptic to the equator.

Along with this variation there will also be a small precession in the equinoctial points. These changes, however, are very small, and scarcely become apparent till after the lapse of ages.

By comparing about one hundred and sixty observations of the obliquity of the ecliptic, made by ancient and modern observers, with the obliquity of twenty-three degrees, twenty-eight minutes, and sixteen seconds, as observed by Tobias Mayer, in 1756, we have found, from a view of all the results, that the diminution of the obliquity of the ecliptic, during a century, is fifty-one seconds; a result which accords wonderfully with the best observations.

It ought to have been mentioned in page 36 that the diminution of the obliquity of the ecliptic will not affect the sun's declination till after the lapse of ages; for the principal cause of the sun's declination being erroneous one day, in some of the old epitomes of navigation, before the year 1800, see Reformation of the Calendar, page 38. It must be observed, that in the epitomes of navigation published since the year 1800, the declination has been corrected up to the date of their publication.

ON

THE NATURE

OF

THE TIDES.

THE ocean, it is well known, covers more than one half of the globe; and this large body of water is found to be in continual motion, ebbing and flowing alternately without the least intermission. What connexion these motions have with the moon, we shall see as we proceed;' but at present, it will be sufficient to observe that they always follow a certain general rule. For instance, if the tide be now at high water mark, in any port or harbour which lies open to the ocean, it will presently subside, and flow regularly back for about six hours, when it will be found at low water mark. After this it will again gradually advance for six hours, and then return back, in the same time, to its former situation; rising and falling alternately, twice a day, or in the space of about twenty-four hours.

The interval between its flux and reflux is, however, not precisely six hours, but about eleven minutes more; so that the time of high water does not always happen at the same hour, but is about three-quarters of an hour later every day, for thirty days; when it again recurs as before. For example, if it be high water at any place to-day at noon, it will be low water at eleven minutes after six in the evening; and consequently, after two changes more, the time of high water the next day will be at about three-quarters of an hour after noon. The day following it will be at about half an hour after one; the day after that at a quarter past two; and so on for thirty days, when it will again be

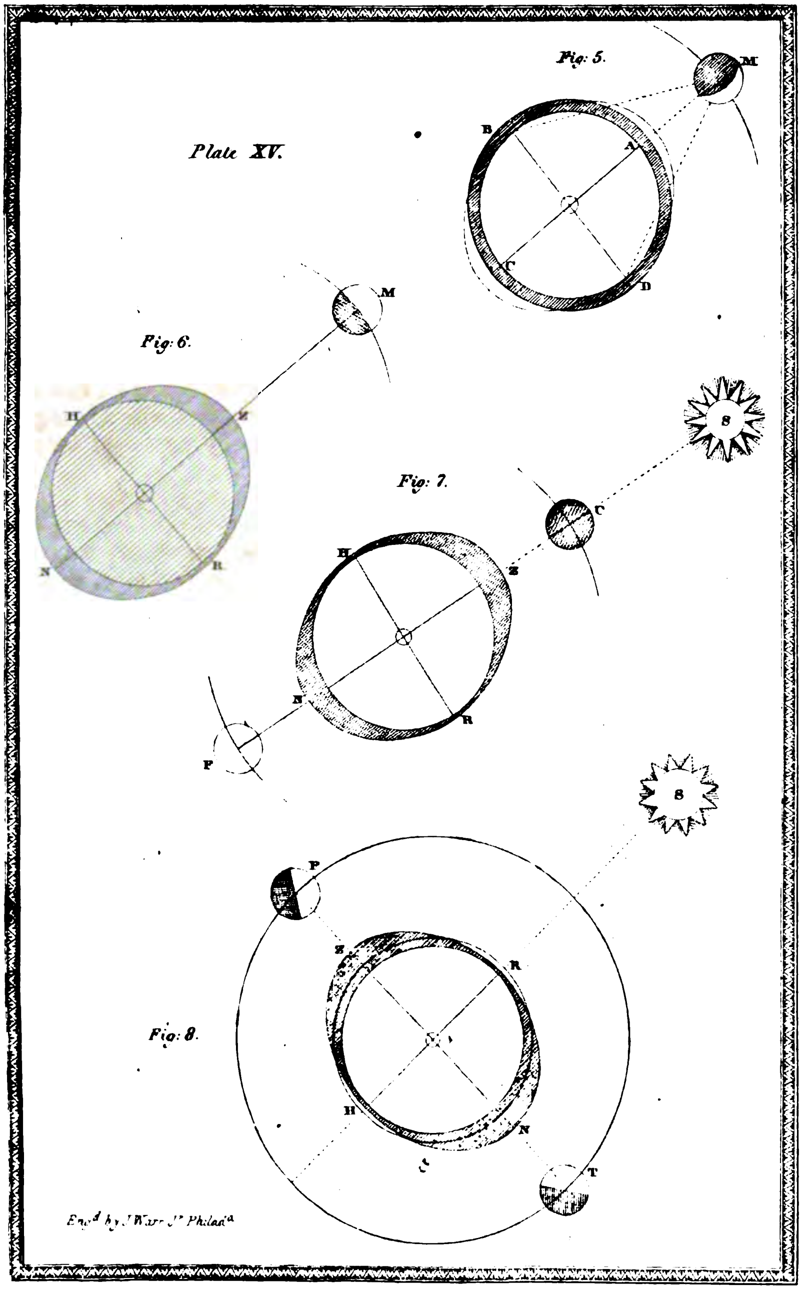


Plate XV.
Fig: 5.
M
B
A
C
D
Fig: 6.
M
H
Z
N
R
Fig: 7.
S
C
H
Z
N
R
F
Fig: 8.
S
P
Z
R
H
N
T
Eng^d by J. Warr J^r Philad^a

found to be high water at noon, the same as on the day the observation was first made; and this exactly answers to the motion of the moon. She rises every day about three quarters of an hour later than the preceding one; and, by moving in this manner round the earth, completes her revolution in about thirty days, and then begins to rise again at the same time as before.

To make the matter still plainer; suppose, at a certain place, it is high water at three o'clock in the afternoon upon the day of the new moon; the following day it will be high water at about three quarters of an hour after three; the day after that at about half an hour past four; and so on, till the next new moon, when it will again be high water about three o'clock, the same as before; and by observing the tides continually at the same place, they will always be found to follow the same rule; the time of high water, upon the day of every new moon being nearly at the same hour, and three quarters of an hour later every succeeding day.

Such a perfect harmony of motions as is here pointed out, could not possibly arise from the mere concurrence of fortuitous causes, or the uncertain operations of blind chance, as many sceptical philosophers affect to believe. On the contrary, they are in such exact conformity with the motion of the moon, that, independent of all mathematical considerations, we should certainly be induced to look to her as their cause. Neglecting, therefore, for the present, all such exceptions as affect not the truth of the theory, we will now proceed to show from Newtonian principles, that these phenomena are occasioned prinpally by the moon's attraction.

For this purpose, let M. (Plate XV. fig. 5.) represent the moon, O the centre of the earth, and A, B, C, &c. different points upon its surface; and, for the sake of perspicuity, let us suppose the earth to be entirely covered by the ocean. Then, because it is the property of a fluid for its parts to yield, and obey any force impressed upon them, it is clear that the moon M, acting upon the surface of the sea, at the point A, B, C, &c. will elevate the waters in those parts, and draw them towards her, by her attractive power. But the point A being nearer to the moon than the point C, the attraction at A will be greater than at C; and because the points B and D are at equal distances from the moon, the attraction at those points will also be equal, and so at any other intermediate points, the attractive force will be different, according to their different distances from the moon.

From this example, then, it is sufficiently evident, that the attractive force of the moon, acting unequally upon different parts of the ocean, must occasion it to assume a different figure

from what it would otherwise have, if there were no such unequal attractions. And, since this attractive force is greatest on the part of the ocean which lies immediately under the moon, the water will of course flow constantly to that part, and be elevated or depressed at different places, according as the situation changes with respect to those places. But as the earth turns round on its axis, from the moon to the moon again, in about twenty-four hours and three quarters, the flux and reflux will be necessarily retarded from day to day, about three quarters of an hour, which is agreeable to experience, and what we have before mentioned.

So far it must appear perfectly clear, that the tides are occasioned by the attractive force of the moon: but a circumstance the most singular and difficult to conceive remains yet to be explained; which is, that they ebb and flow twice a day, or in the space of about twenty-four hours. When the moon passes the meridian of any place, or is at her greatest height above the horizon of that place, she will evidently attract and elevate the waters which lie immediately under her: but what is the reason, that twelve hours afterwards, when she passes the meridian below the horizon, the waters at the same place are then also elevated? We know from experience, that, whether the moon be in the zenith or nadir, the phenomenon is nearly the same; it being high water with us at the same time that it is high water with our antipodes.

This circumstance seemed, at first, so opposite to the nature of attraction, that some philosophers, who did not examine it with proper attention, thought it a sufficient refutation of that doctrine: but the edifice of Newton is built upon a rock, and is not to be shaken by every idle wind that blows. It was ingenuously observed upon a similar occasion, by his polite and candid opponent, the marquis de Polignac, that what this great man asserts to be a fact must not be hastily rejected; and I shall now show you the necessity of attending to this precaution in the instance before us.

Let M (Plate XV. fig 6.) represent the moon as before, O the centre of the earth: and Z and N those parts of the surface which are nearest to the moon, and farthest from her; and, for the sake of perspicuity, let us suppose the earth in this instance also to be entirely covered by the ocean. Then, because the point Z is nearer to the moon than any other part of the hemisphere H, Z, R, it is evident that the waters will be more strongly attracted by her about that point than at others which are more remote; and since this attraction acts in a contrary direction to that of the earth, the waters in all parts, from H, R to Z, must have their gravity, or tendency towards the centre O diminished; and as this tendency is the least at the point

Z, they will, consequently, stand higher there than in any other part of the hemisphere.

Again, in the opposite hemisphere H, N, R, although the attraction of the moon conspires with that of the earth, yet, as it is known to decrease in proportion as the squares of the distances increase, it is plain that the joint influence of the two forces, taken together, will be less at the point N, on the side opposite to the moon, than at those parts which lie nearer to H, R; and, consequently, as the gravity of the waters, or their tendency towards the centre, is also the least at that point, they will be more elevated there than in any other part of the hemisphere; so that the attractive force of the moon will evidently raise the waters, both at that point of the surface which is nearest to her, and at that which is farthest from her, at the same time, as was to be shown.

Following this system, then, it is to be observed, that at any port or harbour which lies open to the ocean, the action of the moon will tend to elevate the waters there, when she is on the meridian of that place, whether she be above the horizon or below it. But the water cannot be raised at one place, without flowing from and being depressed at another; and these elevations and depressions will obviously be the greatest at opposite points of the earth's surface. When the moon raises the waters at Z and N, they will be depressed at H and R; and when they are raised by her at H and R, they will be depressed at Z and N. And as the moon passes over the meridian, and is in the horizon twice every day, there will therefore be two tides of flood and two of ebb, in that time, at the interval of about six hours and eleven minutes each; which is exactly conformable to theory and experience.

One great privilege of genius seems to be that of considering difficult things under a point of view which renders them more simple and perspicuous, and enables the mind to comprehend and follow them with ease and facility. This felicity of conception was possessed by Newton in the highest degree. He always knew, in every case which required investigation, the proper mode of resolving the question. Geometry and mechanics were his favourite sciences, and, by their means, he soon conquered every difficulty. We have seen, in the present instance, how easily he removed objections, and reconciled apparent contradictions. The occurring of the tides at the same place twice a day, was made use of as an argument against the truth of his grand principle of attraction: but this, so far from being repugnant to that doctrine, he has shown to be a necessary consequence of it.

Another seeming objection may also be removed with the same ease. From a slight consideration of what has been said,

you might be led to imagine, that the time of high water at any place, would be when the moon is over the meridian of that place. But this is by no means the case; it being usually about three hours afterwards; the reason of which may be shown as follows. The moon, when she is on the meridian, or nearest to the zenith of any place, tends to raise the waters at that place; but this force must evidently be exerted for a considerable time before the greatest elevation will take place; for if the moon's attraction were to cease altogether, when she has passed the meridian, yet the motion already communicated to the waters would make them continue to ascend for some time afterwards; and, therefore, they must be much more disposed to ascend when the attractive force is only in a small measure diminished.

The waves of the sea which continue after a storm has ceased, and almost every other motion of a fluid, will illustrate this idea; all such effects being easily explained, from the consideration that a small impulse, given to a body in motion, will make it move farther than it would otherwise have done. It is also, upon the same principle, that the heat is not the greatest upon the longest day, but some time afterwards: and that it is not so hot at twelve o'clock, as at two or three in the afternonon; because there is a farther increase made to the heat already imparted. Instead of its being high water then, when the moon is upon the meridian of any place, it will always be found to happen, as far as circumstances will allow, about three hours afterwards; and the intervals between the flux and reflux, must be reckoned from that time in the same manner as before. From what has been hitherto said, it may be supposed that the moon is the sole agent concerned in producing the tides. But it will be necessary to observe, before we quit the subject, that the influence of the sun would also produce a similar effect, though in a much less degree, than from his superior magnitude we should naturally be led to imagine. For it is not the entire actions of those bodies upon the whole globe of the earth, that is here to be considered, but only the inequalities of those actions upon different parts of it. The whole attractive force of the sun is far superior to that of the moon; but as his distance from the earth is near four hundred times greater, the forces with which he acts upon different parts of it, will be much nearer to equality than those of the moon; and consequently will have a less effect in producing any change of its figure. For it is to be observed, that if all parts of the earth were equally attracted, they would suffer but little change in their mutual situations.

That this doctrine may be still more clearly understood, let it be considered, that though the earth's diameter bears a considerable proportion to the distance of the earth from the moon, yet, this diameter is almost nothing when compared to the distance

of the earth from the sun. The difference of the sun's attraction, therefore, on the sides of the earth under and opposite to him, will be much less than the difference of the moon's attraction on the sides of the earth under and opposite to her: and for this reason, the moon must raise the tides much higher than they can be raised by the sun. Newton calculated the effect of the sun's influence, in this case, and found it about three times less than that of the moon. The action of the sun alone would, therefore, be sufficient to produce a flux and reflux of the sea; but the elevations and depressions occasioned by this means, would be about three times less than those produced by the moon.

The tides, then, are not the sole production of the moon, but of the joint forces of the sun and moon together. Or, properly speaking, there are two tides, a solar one and a lunar one; which have a joint or opposite effect, according to the situation of the bodies which produce them. When the actions of the sun and moon conspire together, as at the time of new and full moon, the flux and reflux become more considerable; and in this case they are called the Spring Tides. But when one tends to elevate the waters, whilst the other depresses them, as at the moon's first and third quarters, the effect will be exactly the contrary; the flux and reflux instead of being augmented, as before, will now be diminished; and they are then called the Neap Tides.

But as this is a matter of some importance, it may be worth while to enter into a more minute explanation of it. For this purpose, let S (Plate XV. fig. 7.) represent the sun, Z H N R the earth, and F C the moon at her full and change. Then, because the sun S, and the new moon C, are nearly in the same right line with the centre of the earth O, their actions will conspire together, and raise the water about the zenith Z, or the point immediately under them, to a greater height than if only one of these forces acted alone. But it has been shown, that when the ocean is elevated at the zenith Z, it is also elevated at the opposite point, or nadir, N, at the same time; and, therefore, in this situation of the sun and moon, the tides will be augmented. Again, whilst the full moon F raises the waters at N and Z, directly under and opposite to her, the sun S acting in the same right line, will also raise the waters at the same points N and Z, directly under and opposite to him; and therefore, in this situation also, the tides will be augmented; their joint effect being nearly the same at the change as at the full; and in both cases, they occasion what are called the Spring Tides.

Pursuing the illustration in the same way, let now F and T (Plate XV fig. 8.) be the moon in her first and third quarters, and the rest as before. Then, since the sun and moon act in the right lines S O and F T, which are nearly perpendicular to

each other, their forces will tend to produce contrary effects; because the one raises the waters in that part, where the other depresses them. The sun's attraction at R and H, will diminish the effect of the moon's attraction at Z and N; so that the waters will rise a little at the points under and opposite to the sun, and fall as much at the points under and opposite to the moon; and of course the lunar tides will be diminished in those parts. This respects the moon only in her first quarter, at F; but the same reasoning will evidently hold, when applied to the moon in her third quarter at T; for as the sun and moon still act in lines which are perpendicular to each other, they must produce the same diminution as before; and in both these cases they occasion what are called the Neap Tides. But it must be observed, that neither the Spring nor Neap Tides happen, when the sun and moon have the precise situations here mentioned; because, in this case, as in others of a similar kind, the actions do not produce the greatest effect when they are the strongest, but some time afterwards.

The effects of the disturbing forces of the sun and moon, depend, likewise, upon their respective distances from the earth, as well as upon their particular situations. For the less the distances are, the greater will be their effects; and, consequently, in winter, when the sun is nearer to the earth, the Spring Tides will be greater than in summer, when he is farther off; and the Neap Tides on that account, will be less. For a like reason, as the moon moves in an elliptical orbit round the earth, and is nearer to us at some times than at others, the tides will, at those times, be greater, and at the opposite points of her orbit less. Some variations, likewise, take place in consequence of the different declinations of the sun and moon at different times. For if either of these luminaries were at the pole, it would occasion a constant elevation both there and at the opposite one, and a constant depression at the equator; so that as the sun and moon gradually decline from the equator, they lose their effect, and the tides becomes less; and when they are both in the equator, the tides of course become greater.

These are the principle phenomena of the tides; and where no local circumstances interfere, the theory and facts will be found to agree. But it must be observed, that what has been here said, relates only to such places as lie open to large oceans. In seas and channels, which are more confined, a number of causes concur, which occasion considerable deviations from the general rule. Thus, it is high water at Plymouth about the sixth hour, at the Isle of Wight about the ninth hour, and at London bridge about the fifteenth hour, after the moon has passed the meridian. And at Batsha, in the kingdom of Tonquin, the sea ebbs and flows but once a day; the time of high water be-

ing at the setting of the moon, and the time of low water at her rising. There are, also, great variations in the height of the tides, according to the situation of coasts, or the nature of the straits which they have to pass through. Thus, the Mediterranean and Baltic seas have very small elevations; while, at the port of Bristol, the height is sometimes near thirty feet; and at St. Malo's it is said to be still greater.

What has been said of the ocean may likewise be applied to the air; for the surface of the atmosphere being nearer to the moon than the surface of the sea, it is plain that the aërial tides must be much more considerable than those of the ocean: and on this account it should seem to follow, that the mercury in the barometer would sink considerably lower than at other times, when the moon passes the meridian; because her action on the particles of air, must, at that time, make them much lighter. But it must be considered, that in proportion as these particles are rendered lighter, a greater number of them are accumulated, till the deficiency of gravity is made up by the height of the column; and as there is then an equilibrium, the pressure will evidently be the same as before; so that the murcury in the barometer cannot be much affected, by means of these tides.

An easy Method of finding the Time of High Water by using the Nautical Almanac.

Rule to find the Time of the Moon's passing the Meridian on the given day in page VI of the Month in the Nautical Almanac.

With this time enter table A and take out the corresponding correction, which add or subtract from the above time, as directed in the table.

To this sum or remainder add the time of high water at the given place on full and change days, and the sum will be the time of high water past noon of the given day; but if the sum exceed $12^h\ 24'$, or $24^h\ 48'$, subtract either of them as required, and the remainder will be the time of high water in the afternoon.

Required the time of high water at Dungeness, April 7th, 1821.

On that day the moon passes the meridian,	$4^h\ 40'$
Correction from Table A.	1 7
Difference, (*carried over.*)	3 33

Difference, (*brought over*,)	3 33
The time of high water at full and change at Dungeness,	10 51
Sum,	14 24
Subtract	12 24
High water at Dungeness in the afternoon,	2 00

Required the time of high water at Cape Henlopen, April 7th, 1821.

On that day the moon passes the meridian at	4h 40′
Correction from Table A.	1 7
Difference,	3 33
The time of high water at Cape Henlopen,	9 00
Sum,	12 33
Subtract,	12 24
High water 9 minutes past noon,	0 9

A.

Moon's passage over meridian.	Correction.	Moon's passage over meridian.
h m	h m	h m
0 0	sub. 0	12
0 30	0 8	12 30
1 0	0 15	13 0
1 30	0 24	13 30
2 0	0 33	14 0
2 30	0 41	14 30
3 0	0 50	15 0
3 30	0 57	15 30
4 0	1 3	16 0
4 30	1 7	16 30
5 0	1 8	17 0
5 30	1 6	17 30
6 0	1 0	18 0
6 30	0 50	18 30
7 0	0 30	19 0
7 30	0 14	19 30
8 0	add 3	20 0
8 30	0 14	20 30
9 0	0 22	21 0
9 30	0 24	21 30
10 0	0 23	22 0
10 30	0 21	22 30
11 0	0 15	23 0
11 30	0 9	23 30
12 0	0 0	24 0

If great accuracy be required, and the longitude be considerable, the time of the moon's passage over the meridian of Greenwich, may be reduced to its passage over any other meridian. I have omitted this correction for the longitude of Cape Henlopen in this last case, as it was too small to be taken into the calculation. Without the longitude is considerable, it is not worth while to reduce the passage of the moon over the meridian of Greenwich, to that of any other meridian, and even if the longitude be considerable it will make but from six to thirty minutes, and by omitting this last correction, it makes this method very easy and pleasant.

To find the Time of High Water at Full and Change of the Moon at any Place.

RULE.

Supposing it be required to find the time of high water at full and change, at Cape Henlopen, on the 4th of June, 1821, and the observed time of high water should be $12^h\ 8'$. The moon's passage over the meridian on that day was $4^h\ 1'$ and the correction for longitude $10'$.

The moon's passage over the meridian of Greenwich, as found in page VI. of the Nautical Almanac on the 4th of June, 1821,	4^h	$1'$
Correction for longitude, add in west longitude,		10
	4	11
Correction from Table A, subtractive,	1	3
	3	8
The observed time of high water at Cape Henlopen,	12	8
Gives the time of high water at full and change, at Cape Henlopen,	9	0

To find the correction of longitude, reduce the moon's passage over the meridian of Greenwich to that of any other meridian, viz. in the VIth page of the month in the Nautical Almanac, find the time of the moon's coming to the meridian of Greenwich on the given day, and also the time of her coming to the meridian of Greenwich the next day, when you are in west longitude, but the preceding day when in east longitude; take the difference between these times; then say as twenty-four hours is to the longitude in time, so is the daily difference to the correction, as in the following examples.

EXAMPLE I.

Required the correction for longitude 75 west, on the 5th of October, 1821.

In the Nautical Almanac the moon passes the meridian of Greenwich at	7^h 19′
The moon passes the meridian on the 6th at	8 12
Difference in twenty-four hours,	53

Longitude in time, 5 hours. Then say as 24 hours is to 5 hours so is 53 minutes to 10 minutes, correction sought, which added to 7 hours 19 minutes, gives 7 hours 29 minutes, the time of the moon's coming to the meridian of ship or place on the given day.

EXAMPLE II.

Suppose in 75 degrees east longitude on the 5th of October, 1821, it be required to find the correction for longitude, and the time of the moon's coming to the meridian of the place. The moon comes on the meridian of Greenwich on the 5th at 7^h 19′

Ditto on the 4th,	6 25
Difference in 24 hours,	54

Then say as 24 hours is to 5 hours so is 54 minutes to 11 minutes.

The time of coming to the meridian on the 5th,		7^h 19′
Correction,	subtract	11
The time of the moon's coming to the meridian of ship,		7 8

Or with the difference in 24 hours enter Table XIV, at the top of which find 54′. Under this, and opposite to 75°, in the right hand column, or opposite to 5^h in the left hand column, is the correction 11′, subtractive, because you are in east longitude. But in example the first it is additive, being in west longitude.

ON

THERMOMETRICAL NAVIGATION.

HAVING for the last twenty-seven years been in the practice of using the thermometer, with a view to ascertain its practical advantages, I am enabled to lay before the reader a statement of facts derived from my experience, which I have full confidence will be useful to them, particularly such of them as frequently sail on the coast of North America.

By the use of this instrument, the navigator is enabled to determine whether he is or is not in the gulf stream, on the American coast; for its water being several degrees warmer than that of the adjoining ocean, the rise of the mercury in the thermometer, when placed in the water, will indicate the presence of the gulf stream—and its fall, afterwards, that you have passed out of it. The advantages arising from this knowledge will be obvious, when it is considered that vessels may shorten their passage from North America by keeping in this stream, and in returning from Europe, by avoiding it; vessels after passing through the gulf passage, between the Bahamas and the Florida shore, bound to the United States, particularly when the wind is a head, may also shorten their passage by keeping in the stream. The general indications of this instrument gives also notice of their approach to soundings. This, however, is subject to considerable variation, which is greater or less on different parts of the coast, from the effects of particular winds, and other circumstances, which will be hereafter noticed.

It is well known that the gulf stream is occasioned by the eastwardly trade winds driving the water into the gulf of Mexico, where, becoming above its natural level, it endeavours to seek it, by running between the Bahamas and the Florida shore; it then takes a direction along the coast of America to and over the southern extreme of the Banks of Newfoundland—thence through and among the Western Islands—from thence it takes a south-eastwardly direction, becomes very much spread, runs among the Canary Islands, and to the southward of them strikes the Barbary shore, as far south as cape Blanco, where it arrives at its first starting point; and is again under the influence of the trade winds.

It is extremely probable that the loss of the Brig Commerce, Captain Riley, was occasioned by this stream, and that it is this which drove her on the coast of Barbary.

ing, could not get more than 60 or 70 fathoms perpendicular line: at that depth I found the water to be only two degrees colder than that at the surface; which difference I concluded might be found in any other part of the ocean. I therefore abandoned all further experiments on that subject, reflecting also, that the gulf stream communicates more latterly than perpendicularly.

For those who are curious, I will also add another expedient, by which this experiment may be made. If an empty corked bottle be attached to the lead, and let down to the depth of 35 fathoms or more, the weight of the water will force the cork into the bottle, which immediately filling with water, and being swiftly drawn up, will furnish water of the depth at which it was received into the bottle.

Mr. Jonathan Williams observes, in his treatise on Maritime observations, page 80, that the water on soundings, on the American coast, is colder than the air. But experience has taught me, as well as many others, that this allegation is very erroneous. I have found the relative temperature of the air and water in such places extremely variable, and on some occasions, the former 12° colder than the latter. This may be easily accounted for. When so large a body of water has become heated by a very warm summer, it requires the presence of cold air for a considerable time, in order radically to affect the water. When therefore there is a sudden change of wind from south to north, while the water has not yet undergone this change, the air will be found colder than the water, as it would not immediately be materially affected thus suddenly by the air.

Mr. Williams, however, himself, furnishes a refutation of this fact, which he has above stated. In a journal kept by him, on his passage from Virginia to England, he asserts, that the whole time they were on soundings on the coast of America, the air varied from 5° to 8° colder than the water.

He also says, p. 14, that water over banks, is always much colder than that of the main ocean. This is also incorrect.—It is indeed colder over some banks, but it is warmer over others, which will be seen by referring to my observations in this article, on Cape Lagullas, bank off the Cape of Good Hope, the Bahama bank,—the waters of tropical lattitudes, and those of the coast of America, from Cape Carnival to Cape Hatteras; and some distance to the northward of the latter Cape,—which latter places will be found to disagree with his account, when the wind blows towards the shore on the coast of America.

The velocity of the gulf stream varies under different circumstances. When strong westwardly winds prevail within the limits of the trade winds, it in a partial degree overcomes the force with which the water is driven by the trade winds into the gulf of Mexico; and in this case, there being at that place less water

accumulated than under different circumstances, it takes its course from thence with less velocity, which affects it throughout its whole course; and as the water is the warmer the nearer it is to the line, it also, from this circumstance, taking a longer time to reach the North American coast, is found cooler, from its longer exposure to the air of a more northern latitude. It is also found, that the precise course of the gulf stream is not always the same: but that it also varied with the action of the winds upon it, during its course along the coast of America: for a south-eastwardly wind drives it nearer to the coast, and a north-westwardly wind drives it further out in the ocean. Another effect is also observed from this action of the winds. It is contracted into a narrower channel by the south-east wind, and its velocity thereby increased, and becomes more spread by a north-west wind, and its velocity thereby diminished.

I have had repeated opportunities of observing the variations in the width of this stream, from lunar observations and good chronometers; and I have uniformly found its edges to differ in longitude, at different times in the same latitude, in proportion as the winds tended from the east or from the west; and I will here recite one instance of the gross and dangerous mistakes to which persons are liable, who are unacquainted with its variations.

In 1804, returning from Bordeaux to Philadelphia in the ship Orion, I spoke a schooner on the outward edge of the stream, bound to Rhode Island. Her captain inquired, and I told him my longitude, from a lunar observation taken that morning. But he insisted that I was at least fifty miles nearer the shore, as he had entered the gulf stream; and it was in vain that I endeavoured to convince him of what was actually the case, that a north-west wind, which was then blowing, had set the stream that distance to the eastward of its regular course as laid down in the charts; and thus he left me. Now, if the wind had been in a contrary direction, and, instead of driving the stream fifty miles eastward, had driven it fifty miles to the westward of its usual course; and if he had remained thus obstinate, and taken a fresh departure, he would at least have run his vessel into danger, and perhaps quite ashore; and such instances, I doubt not, have been frequent from such mistakes; and that the disasters of many vessels which have been run on shore between Long Island and the Highlands may be attributed to them.

Though a sudden fall of the mercury *generally* indicates the time when a ship comes into the water between the gulf stream and the shore, and by a further fall declares when she is arrived upon soundings, from latitude 36 degrees north quite to the banks of Newfoundland, yet it is sometimes found otherwise; cases of which I will here recite.

In September, 1800, on my passage from Amsterdam to

Philadelphia, in the brig Tryphena, I found, by a sudden fall of the mercury, from 76 degrees to 72 degrees, that I had passed the gulf stream. I ran in the parallel of latitude 38 degrees, expecting, by a further fall of the mercury, to ascertain that I was on soundings; but finding the temperature of the water to continue at 72 degrees, I continued running at the rate of five knots per hour nearly the whole day; but still finding no difference in the temperature of the water, I ordered the lead to be hove, and was surprised to get bottom at thirty fathoms. With due precautions I continued my course, and found no change in the water's temperature, until I was within ten miles of Cape Henlopen, when it rose to 73 degrees.

In September, 1815, bound from the island of Mayo to Philadelphia, in the ship Recovery, I found, by a sudden fall of the mercury from 74 degrees to 69 degrees, that I had passed the stream. In two hours after, when I had run thirteen miles north-west, it was 65 degrees, and in five hours after, thirty miles north-west, it fell to 62 degrees, when I got soundings in twenty five fathoms, in latitude 35 degrees 30 minutes north. This difference of temperature in the same month, in different years, the winds being both times from the eastward, must be considered very extraordinary; so that no general rule can be positively depended upon.

As a uniformity of difference between the temperature of the water of the gulf stream, and that of the water nearer the land, cannot at all times be relied on, as it is often affected by casual circumstances, it will be prudent for the navigator particularly to attend only to the *sudden* fall of the mercury; and, after finding, by this means, that he has passed the inner edge of the gulf, and does not, in a reasonable time, find a further fall, he may guard against being deceived into danger, by heaving the lead.

In the brig Ruth and Mary, bound from Havanna to Philadelphia, in July 1799, I got soundings in forty-seven fathoms, latitude 36 degrees 40 minutes north, temperature 83 degrees, the same as is in the gulf stream, wind fresh at south-east, had blown the gulf towards the shore. Shortly afterwards it fell to 72 degrees; when I sounded in thirty-two fathoms water. Ran twelve miles on a north-west course, temperature 70 degrees. Sounded in thirty fathoms, when I steered north by west.

In the brig Ruth and Mary, bound from Havanna to Philadelphia, in February the following year, I got soundings on the outer edge of Cape Hatteras shoals, in twenty fathoms; temperature of the water 52 degrees. Twenty minutes before, in the gulf stream, when at the same depth, the temperature was 74 degrees. I shaped my course north-north-east. Shortly afterwards I sounded again in twenty fathoms. The wind backed

from south by west to south-east, and in the course of four hours I was astonished to find the water growing warmer, until I reflected that the south-east wind had driven the water of the stream so far towards the shore. The wind continued at south-east until I arrived in latitude 36 degrees 30 minutes, it then changed to south-west, and continued until I arrived off Chincoteague shoals, when it shifted to north-east.

It may here be observed that on the American coast, as well as in many other parts of the globe, the water on soundings is found colder than the adjoining water of the ocean; but sometimes, from peculiar causes, it is found as warm as the adjoining ocean. I have found it colder from the coast of Georgia to the banks of Newfoundland. Its temperature is, however, varied in different places, and under different circumstances. With the wind blowing towards the shore, I have found the water on soundings, as warm as that of the gulf stream, from the coast of Georgia to sixty miles to the northward of Cape Hatteras: and this temperature has extended quite to the shore. But with a wind that did not blow the water towards the coast, I have always found it colder near the shore, but varying in temperature. Running within the latter limits, therefore, at all times requires caution, especially at night, when it is necessary to heave the lead or stand off.

In the brig Tryphena, in July, 1801, on my passage from Havanna to Philadelphia, latitude 33 degrees 45 minutes, being in the gulf stream, I stood in, north-west, for the purpose of getting between the stream and the land, in order to avoid the heavy thunder-gusts which in that stream are so frequent at that time of the year. The wind was south-east by south. Trying the water with the thermometer, I kept my course, in full confidence of finding a fall of the mercury so soon as I should leave the inner edge of the stream, which I judged I had nearly reached; but after running as far as I thought safe, and perceiving the water where I was become green, I ordered the lead to be hove, and got soundings in thirty fathoms, the temperature of the water being the same as in the stream, which was 85 degrees. I haulded up north; and, after sailing on that course about ten miles, I found eighteen fathoms water, temperature the same as before. I hauled up east-north-east, deepened my water, and then steared north east, until I passed Cape Hatteras shoals. Then I hauled up north by east half east, in sounding, in seventeen fathoms, wind south-east, temperature 73 degrees. This is an instance to prove that the thermometer cannot be depended upon, any where from the coast of Georgia, and well to the northward of Cape Hatteras,* more

* I have been informed of two vessels having been lost on Cape Hatteras

particularly when the wind blows in any degree towards the shore. This may be easily understood from the trending of the coast, the course of the gulf stream, its nearness to land, &c.

From Havanna, bound to Philadelphia, I was steering a north-east course, a little to the southward of Cape Hatteras shoals; the temperature of the water 84 degrees by Fahrenheit, which was the same as in the gulf stream. I ran with full confidence, thinking that I could run on that course with safety, and believing myself within the usual course of that stream. Discovering, however, a change in the colour of the water, I ordered the lead hove, and found bottom in thirty fathoms. The wind was from the south-east, and had driven the warm water of the gulf on soundings, and no doubt also among the shoals. A like instance is related to me by captain David Brown. He was running within these limits, on a north-east course, temperature 82 degrees; and perceiving a change of the water's colour, sounded, and found bottom in twenty fathoms.

These facts should not discourage the use of the thermometer. It will be found a highly useful instrument, in most cases, when running for the coast of America; but it is quite prudent to observe the precautions which are here noticed. In my experience it has saved me much trouble and time, which would have been otherwise taken up in heaving my vessel to; as by its aid I have been enabled to form a pretty correct judgment of my distance from the shore, when taken in connexion with

shoals, from their commanders expecting the water to grow colder inside of the usual course of the gulf stream. But the wind, having considerable easting, drove the warm water of this stream on Cape Hatteras shoals; and it being night, they were deceived by finding no change in the water's temperature. The vessels ran among the breakers, and were lost. One of which cases I was informed of by Mr. Caun, of Baltimore, who drifted ashore on a spar, as did all the rest of the persons on board, excepting one, who was drowned. The other case was that of an English ship, from Whitehaven, bound to Alexandria in Virginia. I was informed of this by her mate, who afterwards sailed with me in the same capacity.

Great caution is necessary in running in towards Cape Hatteras shoals. The thermometer should not altogether be trusted, as has been already mentioned. The lead ought to be hove very frequently. I have been standing towards these shoals in the day time, and have seen the blue and green water so equally divided, as if it had been drawn by a line, and one time had two men prepared with a bucket each, one forward and the other aft, and while the ship was yet in blue water abaft, she was in green water forward, and at that instant had a bucket of water drawn up both forward and aft, and a thermometer put in each bucket, and found the temperature of the water aft to be 80 degrees, and that which was drawn up forward 75 degrees by Fahrenheit's thermometer, being at the same time in fifteen fathoms water. The lead should be hove, running in with these shoals, at least every five minutes; as you come from no bottom upon the shoals very suddenly. Frequently the gulf, or warm water, runs quite on to these shoals, for reasons already mentioned.

the circumstances of the time and place. I here repeat that, in all seasons, and all winds, between the capes of Virginia and the banks of Newfoundland, I have found a sudden fall of the mercury in the sea water, on first leaving the inner edge of the gulf stream; but which has varied in its distance from the shore according to the winds.

In the brig Tryphena, from Havanna, bound to Philadelphia, in December, 1801, I was in the middle of the gulf stream, the wind south-east, but suddenly shifted to north-west, in a heavy gale, which obliged me lay to. I was apprehensive of being driven outside of the stream, where I would find a constant gale from the westward during the winter. To my great surprise, in twenty minutes after the gale commenced, the mercury in the water fell from 72 degrees, which was the temperature of the stream, to 62 degrees; and in half an hour afterwards it experienced a further fall to 51 degrees. This convinced me that the stream was blown off, and had left me inside of it; and I did not meet with it again during my passage. I do not, however, consider this fact singular. If a vessel comes on the coast when the wind is fresh from the south-east, she would find the stream driven in towards the shore; and if the wind should suddenly shift to the north-west, as in the above noticed case, the stream would be driven as much out of its natural course, in an eastwardly direction, and the vessel would be left as I was, a considerable distance from it.

I, for many years, adopted the following method, under the circumstances which are below mentioned, in order to keep within the gulf stream, and thereby expedite my passage to the northward, after I had passed betwixt the Bahamas and the Florida shore. When I had reason to suspect, from the temperature of the water, that I was not in the stream, and was not certain whether I was outside or inside of it, I stood towards the shore. If I found the water to become warmer, I judged myself to have been outside of the stream. I therefore continued my course till I arrived to what I conceived its middle; and then endeavoured to keep in it. But if, while standing towards the shore, I found the water to become colder, it was an evidence that I was inside of the stream; always, however, using the precaution to heave the lead in time during the night. I then tacked and sood off till I found the stream. This method will in general be found the best; for if, while outside of the stream, I should stand to the eastward, I might find no difference of temperature, if I continued my course till I reached Europe.

When this stream runs with velocity, its edges may be known by its rippling, which is greater or less in proportion to its velocity. Therefore, when it is weak no ripples are seen, which,

too, is often the case, in its utmost strength, during a heavy blow.

Those who are bound on the coast of the United States in winter, ought to cross the gulf stream as speedily as possible; as from its eastern edge, at least as far as longitude 40 degrees, in high latitudes, a constant wind blows from the westward, during nearly eight months in the year, including winter; while between the gulf stream and the shore, there is fine weather and southwardly and variable winds. In the second day of a north-west gale, coming off the land, it moderates so that some sail may be carried, if you are inside of the gulf stream, and on the third day there is generally fine weather, when a vessel may have a chance of getting in shore; but to the eastward of the stream a gale generally continues all winter.

Off the coast of the United States, in winter, when the wind hauls round from south to south-west, with rain, the wind chops suddenly round to north-west, and, as the saying is among sailors, comes butt end foremost, so that, thus circumstanced, sail ought to be reduced in time: if not, it will become suddenly so cold that the men will not be able to hand the sails.

In summer, particularly in July and August, frequent gusts happen on the coast of the United States. They come on suddenly, and blow with great violence, attended with thunder and lightning, for about half an hour; so that, when a heavy dense cloud is seen to rise to the westward, or as is more usual, to the northward and westward, sail ought to be speedily reduced. In consequence of omitting this precaution, many vessels have been upset and dismasted. This has been the case more especially with foreign vessels, whose commanders were unacquainted with the peculiarity of the American coast; Among others, the British sloop of war brig call the Braek, which was upset inside of the capes of Delaware, near the lighthouse.

I here subjoin an extract from my journal kept on board the schooner Rampart, from Cape Henry, now Cape Haytien, bound to Philadelphia, in 1818.

Date.		Latitude.		Longitude.		Temp. of the air.	Temp. of the water.	Winds.	REMARKS.
		°	′	°	′	°	°		
Jan.	20	19	52	72	12	79	79	West.	
	21	20	40	72	0	80	80	West.	
	22	22	12	72	0	76	79	N. N. E.	
	23	21	43	72	33	74	77	N. E.	Little Caycas, S.W. end, bore S. by E. 7 leagues.
	24	22	25	72	36	76	76	E. N. E.	East end of Mayaguana S. W. dist. 4 leagues.
	25	24	11	73	23	76	76	E. N. E.	
	26	26	18	75	0	76	76	E. N. E.	
	27	28	31	75	48	74	74	E. N. E.	
	28	30	40	76	48	76	74	South.	
	29	32	40	76	48	70	76	S. W.	In the gulf stream.
	30	32	33	76	41	70	76	N. E.	In the gulf stream.
	31	32	36	76	39	62	68	West	Inside of the stream.
Feb.	1	33	53	76	39	54	72	N. E.	Bottom, thirty-one fathoms, gulf water.
	2	34	33	75	24	56	72	N. N. E.	2 P. M. sounded, 43 fathoms.
	3	35	10	74	55	58	50	S. W.	Bottom, 17 fathoms, black sand.
	4	35	10	73	40	58	72	W. N. W.	In the gulf stream.
	5	36	38	73	8	48	54	West.	Inside of the gulf stream.
	6	37	20	73	50	46	50	N. N. W.	Nearly on soundings.
	7	38	17	73	54	44	40	South.	Bottom, 70 fathoms.
	8	38	28	75	0	42	38	South.	Close in shore, 8 fathoms water.

The above journal furnishes instances, in which the water on soundings is warmer than the air; and in which also the gulf water is found over soundings off Cape Hatteras, and to the southward of that cape. It will also be observed, that on the 31st, the wind being from the westward, drove the gulf water off into the ocean. I therefore do not doubt, that if the wind had been at that time from N. E., as it was the following day, I should have found the water's heat 72° instead of 68°;

as that wind would have kept the stream towards shore, where I then was. It will also be seen, that the water on soundings in 31 fathoms, Feb. 1st, was only seven degrees colder than that off Cape Henry, lat. 19° 52′ N. Jan. 22: that difference only existing between the gulf water in a tropical latitude, and its state when it had run 1200 miles to the northward.

The water of the ocean is liable to many accidental variations in temperature, which might, perhaps, with proper opportunities and sufficient industry, all be traced to their source. Such as I have noticed, I will therefore subjoin, as they may perhaps develop something on this subject.

Though the water on banks and shoals is in most cases colder than the other ocean water, it is sometimes found of equal temperature, especially in tropical climates, and sometimes even warmer, as is the case off the Agulhas Bank.

On the 6th Oct. 1819, on board the ship William Savery, from Liverpool, bound to Canton, in passing over the southern extremity of Agulhas Bank, off the Cape of Good Hope, in lat. 37° S. long. 20° to 22° E. I found a rise of the mercury from 58° to 65°. I suspected that I was in the current that runs over that bank from the eastward, and next day found, by my chronometer, that I had experienced eighty miles westwardly current. The wind being scant, did not enable me to steer more to the southward than an east course, until I got as far as long. 28° E. Afterwards, when I got into lat. 39° 27′, the mercury fell to 56°, nine degrees colder than the water had been for five days previous. During that time I experienced a current from the eastward, of from 60 to 75 miles each day. I now experienced no current.

Returning home, on the same voyage, I found the same current, in crossing that Bank; it was in July, which in that latitude is the depth of winter. I also observed, that, when off its southern edge, with a head wind, from the westward, when I tacked, and stood to the southward, that the water became colder; and I had also occasion to notice, that the water was not so warm when the current was weak, as it was when the current ran with greater velocity. This I was enabled the more accurately to ascertain by means of a good chronometer.

I crossed this bank twice outward, and four times homeward bound, viz. twice in spring, once in summer, and three times in winter; and every time found the water on it warmer than that of the adjoining ocean, and have also found the current on it running to the westward.

This current is doubtless occasioned by the water flowing from the Bay of Bengal and the Arabian sea. Its direction is along the African coast, between that coast and the island of Madagascar, and over the Agulhas Bank; and its warmth may

be fairly attributed to its source being in these tropical latitudes; a warmth which so much distinguishes it in the high latitude near the Cape of Good Hope.

Between the tropics, I have found no difference between the temperature of the water on banks and that of the adjoining ocean, excepting where it is very shoal, from three to five fathoms, in which case it is one or two degrees warmer. That on the Bahama Banks may be cited as an instance of this fact, where I have noticed it to be one degree warmer than the water of its neighbourhood.

In September, 1819, in the brig Susan, from Hamburgh, bound to Philadelphia, a circumstance occurred which I consider singular. When the Grand Bank bore S. W. distant about 130 miles, the mercury in the water suddenly sunk twelve degrees. By a lunar observation, which I had taken a short time before, I was satisfied that I was yet far from the Bank. I was therefore much surprised at this fact, which I considered as an indication of our arrival on the Bank; and from this conviction assured my passengers that this was really the case. I hove my vessel to, and sounded, and was again astonished in a greater degree, on finding no bottom with 100 fathoms of perpendicular line. I was equally mortified and disappointed; yet still supposing that the Bank might be more to the N. E. than is laid down on the charts, I continued to heave the lead, at short intervals, but got no bottom until I had sailed on a south-west course 130 miles, when the mercury immediately rose five degrees.

I will risk the conjecture, that the greater coldness of the sea-water, in this instance, than on the bank, was either occasioned by the cold water flowing from the river St. Lawrence, and passing through the straits of Belleisle, between New-Britain and Newfoundland, or that it was a current coming from the north-east. I think it probable, had the banks of Newfoundland bore west in any latitude, from 42 degrees to 46 degrees, and I had run for it in that parallel, or made it in any of those latitudes, that I would not have found the water colder until I had arrived on soundings. Had it not been so late in the year, I should have supposed it to have been occasioned by our approach towards a body of ice.

In running for any part of the coast of Europe, it will be unsafe to trust to the thermometer to indicate your arrival on soundings; as there is sometimes little or no difference between the temperature of its water and that of the ocean; and sometimes I have found it to be from one degree to four degrees colder.

From Philadelphia bound to Amsterdam, in the brig Tryphena, in 1800, May 21st, after leaving the Grand Bank, and being in north latitude 45 degrees, I found the mercury sud-

denly rose from 42 degrees to 52 degrees in the sea-water, and it did not vary from that temperature until I arrived off the the Texel, when it rose to 53 degrees.

The following extract from my journal on board the ship William Savary, bound from Savannah to Liverpool, showing the circumstances of my approach to soundings in St. George's channel, will further illustrate the irregularity of the ocean's temperature on the European coast.

May 1819.	Lat.		Long by chronometer.		Long. by lunar observat.		Temp. of the air.	Temp. of the water.	Winds.	REMARKS.
	°	′	°	′	°	′	°	°		
May 2	49	30	22	20			50	50	North.	No soundings.
3	49	10	19	19			52	52	North.	
4	51	6	15	22	15	32	53	53	North.	
5	51	0	11	36	11	44	54	53	North.	
6	50	48	10	50			54	53	North.	89 fathoms sound'gs.
7	50	50	8	0			56	54	E. S. E.	68 do. do.
8	52	0	5	39			56	50	E. S. E.	55 do. do.
9	Made Holyhead.						56	51	E. S.E.	

This extract must convince every person, that it would be extremely dangerous to trust to the thermometer for any information of your arrival on soundings on the coast of Europe; but ought not to make them doubt that the water on soundings sometimes varies from that of the ocean. I repeat that it very frequently does; but it would be at all times imprudent to trust to its indications. If a commander of a vessel should depend upon it, and run on his course, in the expectation of the mercucury's fall giving him warning, he might continue on, without finding any variation in the water's temperature, till he finds himself ashore. Yet, notwithsanding this, the thermometer may be sometimes useful on this coast. It should, therefore, be used; and if a fall in the mercury be observed, try for soundings, especially when you think yourself near it; as this change in temperature does *sometimes* indicate its presence. Heave the lead, and keep a good look-out; as these precautions will always be found, in doubtful cases very important.

It may be also reasonably supposed, that, as you advance more southwardly, to meet soundings, the temperature of the water will gradually become warmer as you approach the warmer latitudes; and that, by the time you arrive on soundings, you may probably have the water of the same temperature, from this cause, as that which you have left; and, on the contrary, in coming from the south-west, you may find the water to increase in coldness as you proceed northwardly; in which case you may find the water on soundings considerably colder than that

which you have left. Much, however, depends on the attending circumstances, such as shifts of wind, currents, difference of seasons, &c.

It may be found useful to try the temperature of the sea-water with the thermometer, every two hours, in all parts of the ocean, as this practice might lead to important discoveries.

Captain John Galvin, of the ship Mercury, from Buenos Ayres towards Chili, in 1820, discovered soundings by the use of this instrument, where none had been laid down in any chart. An extract from his journal is here subjoined.

Date.	Courses.	Winds.	Latitude.	Longitude.	Temp. of the air.	Temp. of the water.
			° ′	° ′	°	°
Feb. 29	S. S. W.	W. N. W.	46 56	58 30	62	56
Mar. 1	S. W. ½ S.	Variable.	47 45	59 30	61	55
2	S. W. ½ S.	Variable.	49 48	61 37	61	53
3	S. S. W.	Variable.	50 55			

REMARKS.

On the 29th the water changed colour, and the fall of the mercury indicated soundings.

On the 2d of March, saw the Falkland Islands, bearing from south-east to south-west. At half past 7 last evening, being then about forty miles north of the islands, sounded in eighty-five fathoms. Coarse sand. In standing to the westward, during the night, deepened our water, and in standing back to the east, shoalened it.

By this it will be seen that these soundings have no connexion with the main land, the thermometer in the sea-water rising when standing to the westward. From the state of the thermometer for the last three days, it was captain Galvin's opinion, that a bank extends from the Faulkland Islands, in a northwardly direction, to latitude 47 degrees. Captain Galvin also concludes, that there is no connexion between this bank and that of the western main land, or otherwise that there are very deep soundings.

Dr. Franklin, in his Maritime observations, published in the second volume of the American Philosophical Transactions, page 315, makes the following remarks.

" The thermometer may be a useful instrument to navigators, since currents coming from the northward into the southern seas, will *probably* be found colder than the water of those

seas, as the currents from the southern seas running into the northern are found warmer."

Notwithstanding, however, the authority of so great a man, experience has taught me that this theory is liable to much objection. I have often found my vessel set to the northward, and at the same time the ocean water becoming colder. As currents are known frequently to shift to contrary points of the compass, in the open sea, as well as near the shore, that which I have just remarked may with plausibility be attributed to my having entered the current at the commencement of the change of its direction from south to north; and that I have been carried northward by the same body of water that had just run to the south. From a similar cause, the commencement of a southwardly wind in winter, where a north wind has just ceased to blow, is found nearly as cold as the north wind.

In cases of sudden change in the temperature of the sea-water, I have generally found my ship to be more or less affected by a current, which I discovered by the aid of my chronometer. But nothing in the temperature sufficiently indicates the direction of the current. Sometimes, however, on a change of the water's temperature, I have not been sensible of any current whatever. Perhaps this has been when the current was on the turn. Yet, notwithstanding this uncertainty, the thermometer's indication may serve to put navigators on their guard, as thus to avoid danger.

Description of the Thermometer.

The thermometer is an instrument to measure different degrees of heat. It is a small glass tube, with a bulb at the bottom. Having the bulb and part of the tnbe filled with mercury or spirits of wine, the tube is closed at the top, and the part not occupied by the fluid is a vacuum. Against the tube there is a scale to measure the expansion of the fluid, under different temperatures. The fluid expands by heat, and contracts by cold. An increase of heat will therefore make the fluid rise, and a decrease of heat will make it fall.

The thermometer now in use is that which was constructed by Fahrenheit. On this scale the fluid stands at 32 degrees, when it just begins to freeze; and at 212 degrees when put into boiling water. At temperate it stands at 55 degrees; summer heat at 76 degrees; blood heat at 98 degrees. If the scale be continued to 600 degrees, it gives the heat of boiling mercury; and if it be continued downward to 90 degrees below zero, it gives a degree of cold which will freeze mercury.

Cautions in using the Thermometer.—Remedy of its Defect.

This instrument should at times be turned upside down, in order to discover if any air has been admitted into the tube. When thus reversed, if the mercury run freely from one end of the tube to the other, there is a perfect vacuum in the upper part of the tube, and its indication of degrees of heat will be therefore correct. But if any air is contained in it, the mercury in this case will be suspended; and the upper end of the instrument should therefore be examined. If there should be found in this place the least opening to admit air, the instrument should be put into hot water (but not hot enough to burst the tube) when the mercury, if the heat be sufficient, will rise so as entirely to fill the tube, and thus force out the air; at which time the aperture should be immediately closed with sealing wax, which will cure the defect.

To seal a thermometer hermetically, is to heat its neck or end till it becomes soft, and then, with a pair of pincers, to close it, by twisting that part together.

ON THE

LAND AND MARINE BAROMETER.

THE Marine Barometer is a useful instrument, in high latitudes, in assisting navigators to anticipate approaching storms. Previously to a hard gale of wind, there is a great fall of the mercury, and even near the tropics, its fall before a storm or a hurricane is usually considerable.

Within nine or ten degrees of the equator, there seldom or never is a hurricane, or a storm of long duration, but whirlwinds and hard squalls of short duration are sometimes experienced within these parallels of latitude, without any fall of the mercury in the barometer.

The barometer is of little use in predicting storms which may happen within the tropics, except before a severe hurricane; then there is a considerable fall of the mercury, and that is when the latitude is not less than 14 or 15 degrees north or south.

In high latitudes the motion of the mercury in the barometer is uncertain; but previously to a storm or a gale of wind, there is a considerable or great fall of the mercury; and the mercury often rises before the conclusion of the gale, as the equilibrium of the atmosphere begins to be restored.

The mercury falls considerably before a heavy fall of rain; and when the mercury stands low in the barometer, the air is light, and deprived of its expansibility or elasticity. At such a period, rain generally falls. The mercury also sinks on the approach of thunder and lightning, or when the atmosphere is highly charged with electrical matter. In serene, settled weather, the mercury generally stands high, and also in clear frosty weather. In the northern hemisphere, in the open sea, the mercury rises with northwardly, and falls with southwardly winds; because the former, coming from the frozen points near the pole,

are more dense than the latter, which blows from the equatorial regions. In the southern hemisphere the contrary takes place; for there the mercury rises with cold southwardly winds, and falls with northwardly winds. These effects are more particularly observed in high latitudes, in the open sea, for obstructions and irregularities will always happen near the land, because there the rarification and expansibility of the atmosphere is not so equal as over the open ocean.

By a little practice with the marine barometer, and proper attention, the navigator may in some seas be enabled by its indications to take in and make sail.

I have, in several instances, found the marine barometer of material service; once in the ship William Savery, from Savannah, bound to Liverpool, in latitude 47° north, to the eastward of the banks of Newfoundland, after a long continuation of hard gales and squalls from the westward, and gusts, with thunder and lightning; and after clearing away and moderating a little, I was on the point of making more sail; but on observing the mercury to continue very low, I thought it best to defer it a little while; and in twenty minutes afterwards, it blew harder than before, during those several days of heavy gales and sudden gusts, and almost constant lightning; the atmosphere was so completely charged with electrical matter, that a person could not touch our lightning chain without receiving an electric shock in some degree, and the compass card frequently fluttered very much; but when the gale began to cease in reality, the mercury began to rise at the same instant with the first appearance of the gale's breaking; a great fall of the mercury in the barometer is a sure indication of the approach of a hurricane in latitude not less then 14° or 15° within the tropics, north or south. In the year 1806, while I was at the Isle of France, in the ship Orion, of Philadelphia, there was a very heavy hurricane in February, and another in March, which did much damage; and two vessels were lost at the island of Bourbon. The fall of the murcury at this place, is so certain an indication of an approaching hurricane, that the lieutenant of the port went on board every vessel then lying in port, to give instructions to have the yards and topmasts down, the vessels well ballasted and well secured with cables and anchors. Cables and anchors can always be hired at that place; and although I had the Orion secured with two anchors of 7000 lbs. each, they were brought home, and the ship went on shore, as well as every other vessel in that port, though all were got off without damage, except one ship, called the Topaz of New York, which, by drifting on to an anchor fluke, which went through her bottom, and, by that means, nearly filled with water. She was afterwards got up and repaired. The lieutenant of the port gave these instructions one

day previous to the hurricane, so that the barometer is certainly useful to those sailing in the hurricane months near the island of Roderigo, the Isles of France and Bourbon, and the bay of Bengal. Vessels and lives might be saved, by preparing for hurricanes in time.

RULES

For predicting the weather by the Barometer, by Drs. Halley and Hutton, Messrs. Pascal, Patrick, Rowing, Changeux, De Luc, Clark, Hattan, and many others, from whose writings the following rules are collected.

When the mercury rises it is a sign of fair weather, attended with heat, if in summer, but frost in winter. When the mercury falls it denotes wind and rain, or perhaps both. If the mercury rises suddenly during the time of rain, the ensuing fine weather will not continue long, but if the rise be gradual and continues for several days, the continuance of fair weather may be expected. If the mercury falls suddenly several divisions, it is a sign that the succeeding rain will not be of long duration; but if the mercury continues to fall regularly for several days, rain or wind, or perhaps both, will be of considerable duration. The mercury falling considerably in autumn, winter or spring, indicates gales of wind, commonly attended with rain, snow, or sleet; but in summer it denotes rain, and probably thunder and lightning. The mercury stands low with high winds, and still lower if accompanied with rain. If the mercury falls quickly in very warm weather, thunder showers may be expected soon after. If the mercury be in an unsettled and fluctuating state, the weather has the appearance of being very changeable.

If the mercury has been stationary during several days, its surface must be carefully observed, in order to ascertain whether it is rising or falling; for this purpose let the exact figure at the surface of the mercury be observed; then shake the tube a little, and observe if the mercury is more or less convex or concave. If it is more convex, it is a sign the mercury is rising, if the same as before, it is stationary.

If the mercury was concave before the tube was shaken, and more concave afterwards, the mercury is falling; if of the same concavity, or nearly so, it is stationary, but if less concave, it is rising.

Between the tropics there is very little variation in the heights of the mercury in the barometer, except in the before-mentioned cases; and the more distant any place is from the equa-

tor, the greater is the change of the mercury in the barometer; thus at St. Helena the extreme variation is very little; at Jamaica it is only about three-tenths of an inch; at Naples it seldom exceeds one inch. In England the extreme range amounts to about two and an half inches; and at St. Petersburgh, three and an half inches nearly.

RULES

For predicting the weather by the mercury in the barometer, much improved by Mr. Patrick, and on the same principles with those of Dr. Halley.

1st, The mercury's rising in the tube, presages, in general, fair weather; and its falling, foul weather, as rain, snow, hail, sleet, high winds, and heavy gales.

2d, In very hot weather the fall of the mercury indicates thunder.

3d, In winter its rising presages frost; and in frosty weather, if the mercury falls three or four divisions, there will certainly follow a thaw; but in continued frost, if the mercury rises, it will certainly snow.

4th, When foul weather happens soon after the falling of the mercury, expect but little of it; and on the contrary, expect but little fair weather, when it proves fair shortly after the mercury has risen.

5th, In foul weather when the mercury rises much, and continues so for two or three days before the foul weather is quite over, then expect a continuance of fair weather to follow.

6th, In fair weather, when the mercury falls much and low, and thus continues for two or three days before the rain comes on, then expect a great deal of wet, and probably high winds.

7th, The unsettled motion of the mercury denotes uncertain and changeable weather.

8th, You are not so strictly to observe the words engraved on the plate, (though it sometimes agrees with them) as the mercury's rising and falling, for if it stands at much rain, and then rises to changeable, it presages fair weather, although not to continue so long as it would have done if the mercury were higher, so on the contrary, if the mercury stood at fair, and falls to changeable, it presages foul weather, though not so much of it as if it had sunk down lower.

From these observations, says Mr. Rowenge (Natural Philosophy), it is not so much the height of the mercury in the tube, that indicates the weather, as the motion of it up and down;

wherefore, to pass a right judgment of what weather is to be expected, we ought to know whether the mercury is exactly rising or falling, for which the following rules are given.

First, If the surface of the mercury is convex, standing higher in the middle of the tube than at the sides, it is generally a sign that the mercury is rising.

Second, If the surface of the mercury is concave or hollow in the middle of the tube, it is sinking.

Third, If it is level, or rather if it is a little convex, the mercury is stationary; for mercury put into a tube, especially a small one, will naturally have the surface a little convex, because the particles of the mercury attract each other more forcibly than they are attracted by the glass.

Fourth, If the glass be small, shake the tube, and if the air be growing heavier, the mercury will rise about half the tenth of an inch higher than it stood before; and if it is growing light, it will sink also that much. This proceeds from the mercury's sticking to the sides of the tube, which prevents the free motion of it until it be disengaged by the shock. Therefore, when an observation is to be made by such a tube, it ought always to be shaken first; for sometimes the mercury will not vary of its own accord until the weather it ought to indicate, be present.

In approaching the coast of Europe, the greatest heights of the mercury are found upon eastwardly winds, and it may often rain or snow, the wind being in those points of the compass; and the barometer may sink little or none at all, or it may even be in a rising state, the effects of these winds counteracting. But the mercury sinks, for winds as well as rain, in all other points of the compass; but rises when the wind shifts to the north or east, or between these points: but if the barometer should sink with the wind in that quarter, it must be expected to shift soon from that; or if the fall of the mercury should be considerable, a heavy rain is likely to ensue, as it sometimes happens.

The mercury rises with the winds from the east and north, and between these points, on approaching the coast of Europe; but in other places, where the winds are under different circumstances, the effects are different. When approaching the coast of the United States, the barometer rises with west and north winds, and between these points, and falls when it changes from these points. The atmosphere in westwardly winds, on the coast of North America is more dense, for the same reason that eastwardly winds are the more dense on the coast of Europe.

It has been mentioned that you are not so strictly to observe the words engraved on the plates though sometimes they agree.

In Philadelphia, November, 1818, it blew nearly a hurricane from the south-east. Having a marine barometer in my house at the time, I remarked, that during the height of the gale, which was

from midnight till 5 A. M. the mercury in the barometer stood at the words *much rain* on the plate, and as the gale abated, the wind continued hauling until it came out from the north-west, when the atmosphere became clear, and the mercury rose to the word on the plate *changeable.*

Caution is necessary, not to unscrew the box at the bottom of the frame of the barometer, otherwise the mercury will run down out of the tube. This box contains a bag or reservoir open at the upper part. This bag is of flexible leather, and the air pressing upon it, keeps the mercury suspended at its proper height. Through the bottom of the box passes a screw, having upon its end a round plate, which screw presses upon the leather bag, and forces the mercury to the top of the tube, so that it is prevented from breaking the tube by dashing against the top of it, when the instrument is removed from one place to another. When this barometer is used, the screw at the bottom of the frame or box is to be turned, that the mercury may fall to its proper height, and indicate the corresponding changes in the weight of air. The screw is not only let down, that the mercury may subside to its proper height, but also give admission to the action of the external air upon the mercury contained in the bag. When the screw is let down the external air will then pass in through the same hole where the screw passes.

The tube in the Marine Barometer is very small, so as to prevent the mercury from dashing up and down by the motion of the ship, and for which reason, after a marine barometer has been removed from one place to another, and the screw is let down, a longer time is required for the mercury in it to subside than in a common house barometer, which has the tube much larger.

If the box at the bottom of the frame should be unscrewed by mistake or otherwise, and by that means the tube loses the mercury out of it; the mercury can be restored, if there should be any quicksilver on board; but before the mercury will run into the tube, the air must be expelled, which must be done by heating it, either by holding it in a hot gun barrel, or over a chafing dish of hot coals. The air thus being expelled by a paper funnel, that is, paper wrapped tight round the end of the tube like a funnel. Pour the tube quite full of quicksilver, so as not to allow any air to enter it. Do not allow any air bubbles to remain in or adhere to the sides of the tube.

If there should be any small bubbles of air in the tube, by moving them backwards and forwards in the tube, it will help to clear the mercury; and if the mercury be clear or pure, it will appear like a solid rod of steel in the tube.

Being filled after this manner, and being then closely pressed with the finger to prevent the air from entering, then invert the

tube; immerse the end of the tube in the reservoir of mercury, keep the finger to the end of the tube until immersed, not allowing the tube to touch the bottom of the reservoir or bag; then take away the finger and fix it in the frame as before, and the mercury will fall in the tube to its proper height, according to the weight or pressure of the atmosphere; leaving a vacuum in the tube above the mercury, which will allow the free motion of the mercury to rise and fall in the tube, according to the weight or pressure of the atmosphere on the surface of the mercury in the bag. The upper end of the tube is hermetically sealed.

The barometer may be applied to various other purposes than that of predicting the weather. In purchasing bulky goods by weight, such as wool, flax, or silks, the higher the barometer the greater the quantity of weight there will be.

No person ought to go down a mine, subject to fire damp, when the mercury in the barometer is low.

The barometer is also applied to the mensuration of mountains. In accurate observations for measuring mountains, &c. it requires attention in the construction and use of the barometer, and the temperature of the air, for, unless this remains the same, the dimensions of a given quantity of mercury will be variable, and the altitude of the mercury will be an uncertain measure of the weight of the atmosphere; because it is dilated by heat, and contracted by cold, when the weight and pressure are unchanged. Mr. De Luc attended particularly to this circumstance, and contrived to estimate the effects of heat on the quicksilver in the barometer, when it is used for the purposes above-mentioned, by means of a thermometer, the scale of which is divided in such a manner as to indicate with little labour of calculation, the correction to be made on account of heat. As an increase of heat that is sufficient to raise the mercury in the thermometer from the point of melting ice, to that of boiling water, will lengthen a column of mercury in the barometer six lines, which is half a French inch, or rather more than an English half inch. The scale of the thermometer marks the interval between the freezing and boiling points, answering to six lines of the barometer, which is divided into ninety-six equal parts, each of which will correspond to the 16th of a* line in the motion of the mercury in the barometer, dilated by heat; which must be added or subtracted from the height of the mercury in the barometer for every degree of variation of the thermometer, so graduated. A scale of this kind continued above boiling or below freezing water, is annexed to his portable barometer and thermometer.

Mr. De Luc prepared two barometers with their respective

* This is not noticed in predicting the weather by the barometer.

thermometers, graduated in the manner explained; he placed one pair in the cellar of one house, and another in the upper room of another house in the lower station, so as to be exactly on a level with the cellar: he found that the thermometer in the room rose nine degrees, and the barometer nine sixteenths of a line higher than those in the cellar, whence he shows that without allowing for the effect of heat, the difference in the heights of these two barometers would have indicated a difference of about forty-five feet in the heights of these two places, though they were both on the same level.

The aforesaid calculation is only necessary in accurate observations, as has been before mentioned; in predicting the weather it is not necessary.

The barometer is so formed that a column of quicksilver is supported within it, to such a height as to counterbalance the weight of a column of air, of an equal diameter, extending from the barometer to the top of the atmosphere. At the surface of the earth, the height of this column of quicksilver is, at an average, almost thirty inches. As a cubic foot of quicksilver weighs 13,600 ounces avoirdupois, and as the height in the barometer is 2½ feet, or reduced into decimals, thus, 2.5 feet; therefore 13,600 multiplied by 2.5 is equal to 34,000, which is equal to 2,125 pounds on a square foot; and 2,125 being multiplied by 14, which is the number of feet on the surface of a middle sized man's body, is equal to 29,750 pounds pressure of the atmosphere on a middle sized man's body; that is, when the air is of the above gravity, a weight which would be insupportable and even fatal to us, were it not equal in every part, and counterbalanced by the spring of air within us, which is diffused through the whole body, and re-acts with an equal force against the outward pressure. More of this hereafter will be explained when treating of the atmosphere, &c.

The number of feet in height of the atmosphere, corresponding with one-tenth of an inch on the barometer is variable, depending on the temperature and density of the atmosphere. The variation depending on the temperature is shewn in the following table, calculated for every five degrees from thirty-two to eighty, Farenheit's thermometer; from whence it may be easily calculated for the intermediate degrees, allowing twenty-one hundredths of a foot for each degree.

TABLE.	
Thermometer.	Feet.
32	85.86
35	87.49
40	88.54
45	89.60
50	90.66
55	91.72
60	92.77
65	93.82
70	94.88
75	95.93
80	96.99

The altitude thus found will be the altitude corrected, for the density of the air inversely as the mean height of the barometer, at the two stations is to thirty-six inches; therefore,

Rule. Multiply the mean temperature of the two barometers (found in the table) by the tenths of an inch in the difference of the two barometers, and this product by thirty; divide the last product by the mean height of the two barometers, and the quotient will be the answer, or height required, with the error of a few feet only.

The height of the Peake of Teneriffe being measured by the barometer and thermometer.

	Inches.	Tenths.
Barometer at first station,	30	3
Ditto, second station,	19	7
	2)50	0
Mean height of the two barometers,	25	

Inches.	Tenths.	
30	3	
19	7	
10	6	Reduced into tenths of an inch, is 106.

	Thermometer.
First station,	89
Second station,	51
	140

70 mean height of the two thermometers, against which in the table stands 94.88, the mean temperature of the two barometers. Now, according to the rule, multiply 94.88 by 106, and the product by 30, and the last product by 25, and the quotient will be the answer, equal to 12,068 feet. This gives the Peake something more than two statute miles and one quarter, and a little more than two sea miles high, allowing 5,280 feet to one statute mile, and 6,000 feet to a sea mile. This nearly agrees with the measurement of the Peake, taken

in the year 1785, by the astronomers who accompanied La Pérouse on his voyage of discovery round the world.

EXAMPLE.

	Inches.	Tenths.	
Add { First station,	30	3	
Second station,	19	7	
	2)50	0	
	25	0	mean heights of the two baro.

Inches.	Tenths.	
30	3	
19	7	
10	6	equal 106 tenths of an inch.

	Thermometer.
First station,	89
Second station,	51
	2)140

70 mean height of the two thermometers, against which in the Table, stands 94.88.

94.88
106

56928
9488

10057.28
30

25)301718.40(12,068 feet, and $\frac{18}{25}$ of a foot.
25

51
50

171
150

218
200

18

If there should be but one barometer and one thermometer, they may be placed at the foot of the mountain, after the descent, for a few minutes, to give time for the temperature of the air and pressure of the atmosphere to have effect on the mercury in the instruments: then note the difference between the altitudes of both, at the beginning and at the end of the operation, and take the mean gravity and temperature of air during the operation.

The highest mountains in the world are the Andes, in South America, which extend nearly 4300 miles in length, from the province of Quito to the straits of Magellan, the highest of which is called Chimboraco; it is said to be 20,608 feet, nearly four statute miles, and nearly three and a half sea miles above the level of the sea; 2400 feet of which, from the summit, are always covered with snow.

Doctor Hamilton remarks, that the mercury is best cleansed by shaking it in a phial of fresh portions of water.

According to the calculations of different philosophers, the height of our atmosphere is about from 40 to 50 miles from the earth.

The Hygrometer.

The Hygrometer is an instrument to measure the moisture and dryness of the air, and is formed of substances that will expand and contract on any alteration in the atmosphere, as it will receive humidity readily from a moist air, and part with it as readily to a dry air. In moisture it expands, and in dryness it contracts. On the contrary, cord, catgut, &c. contract by moisture, and expand by dryness. Many mechanical contrivances have been invented, to render sensible the smallest variations in the lengths of these substances. A description of one of them is as follows; and any person can make one for himself with very little trouble.

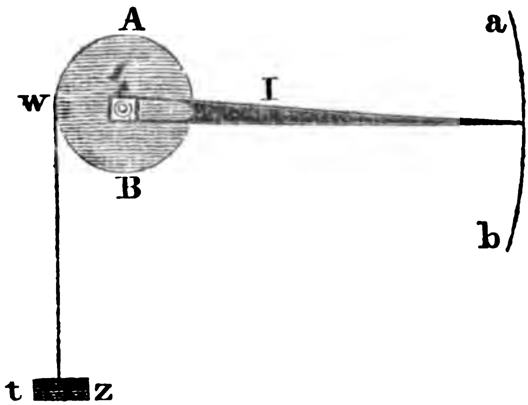


Fig. 30.

Let AB fig. 30, represent the section of the cylinder moveable about its axis, which is parallel to the horizon; at the end there is an index I moveable against a graduated arc *a b*; about this cylinder some catgut *t w* is wound, one end of which is fixed to the cylinder, and the other end to something at Z; now as the moisture of the air increases, the catgut contracts and turns the cylinder, and the motion of the index shows the increase of moisture, and as the air decreases in moisture the catgut will lengthen, and the weight of the index will carry the cylinder back, and the index will show the corresponding decrease of moisture.

In order to make a perfect hygrometer, such substances must be used as will contract or expand in proportion to the quantity of moisture received. Mr. De Luc has made a great many experiments, in order to find out such substances; and the result is, that whalebone and box, cut across the fibres, increase very nearly in proportion to the quantity of moisture received. He preferred the whalebone, first on account of its steadiness, in always coming to the same point in extreme moisture; secondly, on account of its greater expansion, increasing in length above one eighth of itself, from extreme dryness to extreme moisture; lastly, it is more easily made than any other.

Predictions of the Weather by the Hygrometer.

When the index of the hygrometer points and continues to extreme dryness, fair weather, and probably wind, may be expected; but if the index returns to the mean state, it will rain. If the index points to moist and increasing, rain will soon follow; if it returns towards the mean, it will be fair weather.

I have tried many different kinds of hygrometers, but have

frequently been deceived. I think that from its quick sensibility to receive moisture, and as readily to part with it on the least change in the air from moist to dry, this instrument may be a disadvantage rather than an advantage, as any substance which may be colder than the surrounding atmosphere, will find the moisture of the surrounding air condensed on this substance; and by that means imbibe moisture; and on the other hand this substance may also, by some cause, become warmer than the surrounding atmosphere, and by this means the moisture in the atmosphere will be absorbed, and by such accidental cause point the index to the wrong degree, &c. It will be on the same principle that I have seen a glass tumbler filled with cool pump water, in Philadelphia, in summer, when the moisture of the surrounding atmosphere being much warmer than the glass, become condensed on its surface, and the outside surface become quite wet; which leads some to think that the water penetrates through the pores of the glass. But if the glass had been filled with water warmer than the surrounding atmosphere, the moisture round the surface would have been absorbed by the glass.—However, the use of the hygrometer on board ship being in its infancy, I have no doubt that in time, with long practice, some kind of substance may be found to obviate the defects just mentioned. But it is best not to depend too much on its indications.

ON

THE VARIATION

OF

THE COMPASS.

VARIATION of the compass is the deviation of the points of the mariner's compass from the corresponding points of the horizon, and is denominated east or west variation.

East variation is when the north point of the compass is to the east of the true north point of the horizon.

West variation is when the north point of the compass is to the west of the true north point of the horizon.

The variation of the compass is found by various methods, which are given in the epitomes of navigation, by amplitude, azimuths, equal altitudes, &c.

The true amplitude is reckoned from the east or west points. The true amplitude of any celestial object is an arch of the horizon contained between the north or south points thereof and the object's centre, at the time of its rising or setting.*

The magnetic amplitude is an arch contained between the object's centre, when in the horizon, and the magnetic meridian; or it is the bearing of the object per compass, when in the horizon.

The true azimuth of an object is the angle contained between the true meridian and the vertical passing through the object's centre.

* The sun is rising or setting when he appears to have the lower edge about two-thirds of his diameter above the horizon; because the dip being 4 minutes, the refraction about 33 minutes, which make 37 minutes, and the semidiameter being about 16 minutes, which, taken from 37, leaves 21. That being about two-thirds, and as the sun's centre must be in the horizon when he either rises or sets, this calculation will be near enough to find the sun's amplitude, although it may be liable to some small error; such as extraordinary refraction (which I have often noticed in high latitudes) and the lower limb of the sun being more refracted than the upper limb, &c., which error will not affect the magnetic amplitude.

The magnetic azimuth is the angle contained between the magnetic meridian and the azimuth circle passing through the centre of the object.

It is said that the attractive power of the magnet was known in Europe six hundred years before the Christian era; and by the Chinese records it is said that its directive property was known in that country at least a thousand years earlier.

The invention of the compass is by some ascribed to Flavia Goya, of Amalphi, in Naples, about the year 1302. It, however, appears, from some French records, to have been known in that country previous to the year 1180.

Until the time of Columbus it was thought to be invariably the same, at the same place, in all ages. However, in the month of September, 1492, Columbus first discovered the variation of the needle. This discovery is also said to have been made by Sebastian Cabot, in the year 1497. Soon after, the variation was found to be different at different places. It was, however, affirmed to be constant at the same place; but, in 1635, Mr. Henry Gellibrand published his discovery of the change of variation, from a succession of observations, that the deviation was not a constant quantity, but that it gradually diminished. About the year 1657, the needle pointed due north at London, and ever since has been increasing westwardly; and at this time (1822) at London, is about 26 degrees.

The magnetic needle is subject both to an annual and diurnal variation. In the years 1722 and 1723 Mr. Graham made a number of observations on the diurnal variation of the magnetic needle. In 1750 Mr. Wargenton took notice of the regular diurnal variation of the needle, and also of its being disturbed at the time of an aurora borealis, called by some northern lights.*

About the latter part of the year 1756, Mr. Cantor began to make observations on the diurnal variation of the needle, and in

* There have been various opinions and conjectures respecting the cause and properties of these extraordinary phenomena. The most probable opinion is, that they arise from exhalations, and are produced by a combustion of inflammable air, caused by electricity. This inflammable air is generated, particularly between the tropics, by many natural operations, such as the putrefaction of animal and vegetable substances, volcanoes, &c.; and, being lighter than any other air, ascends to the upper regions of the atmosphere, and by the motion of the earth is urged towards the poles; for it has been proved by experiments, that whatever is lighter, or swims on a fluid, which revolves on its axis, is urged towards the extreme points of that axis. Hence these inflammable particles continually accumulate at the poles, and, by meeting with heterogeneous matter, take fire, and cause those luminous appearances frequently seen towards the polar regions. In high latitudes, the aurora boreales appear with the greatest lustre, and extend over the greatest part of the hemisphere, varying their colours from all the tints of yellow, to the most obscure russet. In the north-east parts of Siberia, Hudson's Bay, &c. they are attended by a continued hissing and cracking noise through the air, similar to that produced by fire-works.

1759 he communicated several experiments to the Royal Society of London. The observations were made by him 603 days; 574 out of these the diurnal variation was regular. The absolute variation of the needle westwardly was increasing from about eight or nine o'clock in the morning, till about one or two in the afternoon, when the needle became stationary for some time. After that the variation westwardly was decreasing, and the needle returned back again to its former situation, in the night, or early next morning.

The diurnal variation is irregular, when the needle moves slowly eastward in the latter part of the morning, or westward in the latter part of the afternoon; and also when it moves much either way, or suddenly both ways, in a short time. These irregularities seldom happen more than once or twice a month, and are always accompanied with an aurora borealis.*

The diurnal variation in the months of June and July is almost double that in January and December. Mr. Cantor supposes that the diurnal heat of the sun has this influence upon the magnetic parts of the earth, or rather upon the magnet included in the earth: but Mr. Epinus has shown that this supposition is inadmissible; because, agreeably to the hypothesis, the magnetic nucleus must be very profound, and it will be known that the solar heat does not penetrate to very great depths. There are caves at so great a distance from the surface of the earth, that the thermometer remains always at the same height. The diurnal heat not penetrating to that depth, it is not probable that its effects extend still further.

A writer, of considerable authority, says, in his Theory of Longitude, that the needle is subject to both annual and diurnal vibratory motions. In the first of these, the motion of the north end of the needle is in general towards the east, from the time of the vernal equinox to the summer solstice; and during the other nine months its motion is in general towards the west. In the second, the needle is stationary from noon till about three P. M., and from thence till about eight in the evening, it slowly approaches the east. It again continues stationary about eight in the morning; and from that time till noon it gradually approaches the west. The mean quantity of the diurnal variaation, at the observatory of Paris, in each month of the year 1791, according to the observations of M. J. D. Cassini, is as follows:

* We have few accounts of the *aurora australis*, or southern lights. Captain Cook observed this phenomenon, in 1773, at 58 degrees south latitude. It consisted of long columns of clear white light, shooting up from the heavens to the eastward, almost to the zenith, and gradually spreading over the whole southern part of the sky. Though these columns were, in many respects, similar to the aurora borealis, yet they seemed to differ from them in being always of a whitish colour.

	′		′		′		′
January,	11.3	April,	15.5	July,	14.1	October,	11.3
February,	8.5	May,	11.3	August,	11.3	Novem.	10.2
March,	12.7	June,	11.3	Septem.	11.3	December,	9.8

This diurnal variation is too small to affect the ship's course. I have inserted it here merely to give the navigator an understanding of it.

There are many circumstances, besides those already mentioned, which may put the needle out. Some of which are,

The compasses attracting each other, when they both are in the binnacle at one time,

The quick motion of the ship,

Iron in some part of the ship,

The spindle point being blunt.

Care should be taken that the binnacle be placed perpendicular to the ship's keel, as well as that the lubber's point in the compass-dish be properly placed; both of which are often neglected; and the want of attention to these particulars is often the cause of the disagreement of the compass with its true point.

Upon the Polarity of the Sewing Needle.

THERE are few needles that do not possess polarity. With little exception, therefore, all needles, when floated on water, will tend to the magnetic meridian. Their points will turn to the south. This it is necessary for seamen to be acquainted with: for, should they be so unfortunate as to quit their vessel without a compass, by the use of a common sewing-needle, which seamen are seldom without, they are supplied with a tolerable substitute.

If a needle should be found without sufficient polarity, hold the point towards the south, and rub it strongly from the middle towards the point, with the back of a knife. This will excite a very strong polarity. A dry needle, gently dropped on the surface of water, will swim, unless its upper part become wet; in which case it will immediately sink. If several needles be rubbed as above directed, and stuck together, through a small piece of cork, or other light wood, with their points one way, they will move with a much quicker motion than either of them singly.

To Touch the Compass.

HAVING two strong magnetic bars, lay the compass-needle as nearly north and south as possible, with the intended north to the northward; join the two magnets in a line considerably above the needle, with the north end* of each being northward; then the south end of each will be consequently southward; bring them down upon the needle, so that the place of junction may be over the centre of the needle; then draw them asunder, along each half of the needle; continue their motion until they are eight inches clear of the ends of the needle, and, by a circular motion, bring them again to the centre, and join them as before. Repeat this operation six or seven times, taking care not to put the magnets out of their parallelism, and the needle will be sufficiently magnetical.†

The proper persons to sell magnets are mathematical instrument makers, who will inform purchasers of magnets how to apply them to the needle, as magnets are differently marked. In France I have seen magnetic bars marked as they were to be applied.

The horse-shoe magnet is now generally used. The method of touching the compass-needle with it is, to bring it from a considerable distance above, perpendicularly down upon the centre of the needle; then draw the north magnet from the centre to the south point of the needle, and, by a circular motion, bring it again to the centre. Continue that motion until clear of the needle eight inches; repeat this motion six or seven times. Then the south magnet must be applied to the north half of the needle, as has been done on the south; and the needle will be perfectly magnetic.

If the magnet should be applied wrong on the needle, it will be discovered by the north point of the compass-needle turning to the south; which may be ascertained by comparing it with other compasses on board the vessel.

In all cases, when touching the needle, it must be kept as nearly north and south as possible, with the north end to the northward.

When I was in Marseilles, in 1817, I saw a statement in the gazette, that a discovery had been made in the observatory at

* The reason for drawing the north end of the magnet towards the south point of the compass-needle is, that the north end of the magnet gives a south polarity, and the south end a north polarity, which is treated of under the title "*Magnetism*," which see.

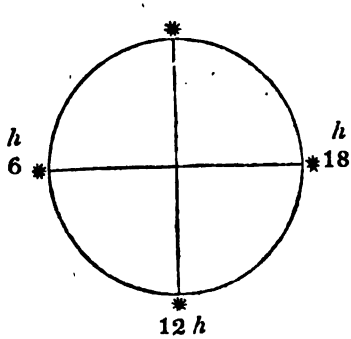
† The magnet must be held flat, when drawn upon the needle; in order to do which, the needle ought to be raised on a block, or other convenient thing.

Paris, that the compass-needle had been for some time stationary, and that it was then returning to the true north. If that be a fact, I have no doubt its confirmation will be made known in due time.

Thomas Yeates, in England, has, with great labour and ingenuity, constructed a variation chart of the navigable globe, from latitude 60 degrees north to 60 degrees south, chiefly from actual observations made by European navigators and astronomers, as recorded in manuscript journals at the hydrographical offices of the admiralty in the East-India house, compared with Spanish surveys in the Pacific Ocean, and collated with tables of variation. This chart was nearly ready in 1816.

In north latitude the north polar star is very convenient for finding the variation of the compass, especially in high latitudes, where, in the day time, the sun is mostly obscured by haze or clouds.

The north polar star is about 1 degree 42 minutes to the south of the north pole, which causes it to make a small circle round the pole, from east to west, or rather the globe revolves from west to east; but which motion is not perceptible, like that of the other stars, in consequence of its being so near the pole. Those who choose to observe its bearings on the meridian, will find that its utmost deviation takes place when it is about six hours from the meridian, on either side of the pole. When it is at that distance from the meridian, above the pole, it is also at the same distance from the meridian below the pole. It bears due north on the meridian of either pole, one degree and forty-two miles of the compass, its greatest distance, agreeing to a little more than one-seventh of a point of the compass. Thus, after it has passed the meridian above the pole, the deviation increases until it is six hours, or nearly from that meridian, which is one-quarter of a circle, or one-quarter part of its revolution, or thereabout: then it begins to approach the meridian below the pole; as will be better understood by referring to the following figure.



Variation at London in the Years

° ′	° ′	° ′	° ′
1576, 10 15 E.	1634, 4 5 E.	1658, 4 30 W.	1747, 17 40 W.
1612, 6 10 E.	1657, 0 0	1700, 8 0 W.	1780, 22 41 W.
1622, 6 0 E.	1666, 1 35 W.	1722, 14 22 W.	

I do not consider it necessary to add any of my own observations on the variation of the compass, as it is continually changing, and is generally different in different ships; and, as opportunities so frequently occur, in high latitudes, to ascertain it by observations of the polar star. In low latitudes, opportunities by the sun are frequent.

How to retain the Magnetical Power of a Compass.

WHEN ships are on long voyages, or lay long in port, and their compasses not in use, the compass-cards should be taken off the spindle-point, and wrapped together in pairs, in dry brown paper, with the north point of one to the south point of the other, and kept at a distance from other pairs. This will improve their magnetic virtue.

Cautions on using Compasses.

WHILE the compasses are in use, be careful that the lubber's point be placed perpendicular to the fore side of the binnacle. When they are not set perpendicular to each other in the binnacle, the compasses are frequently thought to differ.

Wooden compass-bowls are very apt to be turned on one side, by accident; in consequence of which the compasses are thought frequently to be out of the way.

All binnacles should be nailed with copper nails.

Causes which frequently affect Compasses.

CARE should be taken to examine the compasses, in order to ascertain whether they are not affected by something on board of the ship. Iron, when hot, has much greater influence on the

needle, than when cold. It may, therefore, be much affected by a hot stove in the cabin. In the year 1797, a schooner was lost on Chincoteague shoals, in consequence of a hot stove in her cabin attracting the compass-needle out of its proper direction. From a like cause, in coming round from New-York, in the brig Eliza, of Philadelphia, in the same year, my compass, in the binnacle, was attracted four points out of the way; and, if I had not discovered this in time, I should have run the vessel on Barnegat shoals.

It may also be observed, that if a bar of iron stand in a vertical position for a long period, it will become magnetic; and if it remain in that position fourteen years, it will become a complete magnet.

From the above considerations, even brass stoves in the cabin, with copper pipes, may affect the needle; for the pipe being heated, and coming up through the deck, may communicate heat to the iron near it; and also tin is frequently nailed on the bulk-head to prevent the pipe from burning it; which iron or tin, becoming thus heated, attracts the needle; and perhaps, also, the tin may be rendered magnetic, by being a considerable time on the bulk-head, in a vertical position; in which case its power of attraction is further increased.

ON THE

CAUSES OF THE ERRORS

OF

THE COMPASS.

I will here insert Captain Sabin's observations on the Isabella's compasses, on her late voyage of discovery; from the Philosophical Transactions, 1819.

"It is proposed to show in what respects the effects of local attraction, in the above-mentioned ships, were conformable to the observations which had been made in preceding voyages; and how far the errors, which were found to take place on different courses, and under different dips of the magnetic needle, corresponded with the rules for calculating corrections, which Captain Flinders had found useful in his own experience, and which he had recommended for a more extensive trial.

It may be desirable to premise, that the irregularities here alluded to, are not those accidental disturbances which may be caused by iron placed inadvertently too near the compasses, but the permanent and constant effect of the mass of iron contained in a ship, affecting its compasses at all times, and in a greater or a less degree, according as its influence is more or less powerful, in comparison to the directive force of the earth's magnetism.

That errors have always existed from this cause, may be inferred from the uncertainty which experience has attached to the results of azimuths observed in ships. The cause however appears to have been very long unsuspected, whilst its effects have produced a general impression, that the azimuth compass was in itself an imperfect instrument and only to be relied on within certain undefined and variable limits.

It was reserved to the accurate observation, and the habit of recording and comparing apparently trivial and accidental dif-

ferences in results, which distinguished the late Mr. Wales, (astronomer in the second voyage of Captain Cook,) to enable him to lead the way to a knowledge of the nature and causes of these errors. He remarks, "that in the passage of the Resolution and Adventure to the Cape of Good Hope, and subsequently, the greatest west variations had happened when the ship's head was north and easterly, and the least when it was south and westerly, differing very materially from one another with the ship's head in different positions, and still more when observed in different ships." Thus manifesting that they were something more than accidental.

This voyage was the last in which Mr. Wales embarked, and the investigation does not appear to have been pursued in England until the voyage of discovery to Terra Australis, in the first years of the present century. The survey of the coast of New Holland being carried on in a considerable measure by intersection of compass bearings, taken from the deck of the Investigator, so much embarrassment and perplexity were found to arise from the effects of local attraction, that much of Captain Flinders' attention and thoughts were necessarily devoted to a consideration of some means of remedying the inconvenience.

On his return to England, he obtained permission from the Lords Commissioners of the Admiralty, to make a course of experiments in ships under their direction, at the principal sea ports, with a view to ascertain if compasses were similarly affected in other ships, and to try the general applicability of rules which he had found useful in correcting the errors in the Investigator. These rules, with the observations and reasonings on which they were founded, were published in a short paper in the Philosophical Transactions, and in a more detailed form in Appendix No. 2, in the voyage to Terra Australis. There are three points in these statements chiefly worthy of attention, from their practical importance, and on which it seems desirable therefore, to notice how far his observations have been confirmed by those made in the Isabella and Alexander. First, he found that in every ship a compass would differ very materially from itself on being removed from one part of the ship to another. Experience of this source of irregularity had induced him early in his voyage to confine the use of the compass, with which his survey was carried on, to one particular spot. The place he selected was determined by convenience; in other respects it was on the binnacle, and exactly a-midships.

The Isabella and Alexander had not completed half their voyage across the Atlantic, before it was found that the binnacle compasses of the one ship differed very materially, in indicating the course steered, from those of the other; namely, one

point, or 11° 15′. No dependence whatsoever could be placed on the agreement of compasses in different parts of the ship, or of the same compass with itself, if removed but a few inches. Even in the neighbourhood of the binnacles, the variation, as observed a-midships, was from 8° to 10° greater than the result of azimuths taken by a compass placed between two or three feet on the larboard side; and an almost equal difference in a contrary direction took place on removing the compass to the starboard side, rendering it a matter of some trouble and difficulty to make the azimuth compass agree with those in the binnacle by which the ship was steered, and for which it was therefore necessary to determine the variation. As the ships ascended Davis's Strait, these latter compasses began to traverse so sluggishly, that it was necessary to shake the binnacles continually to assist their motion. The cards of these had a metal rim round their circumference, weighing one ounce eleven drachms avoirdupois; which, as the directive power of magnetism diminished, became too heavy for the needle to carry round; they were also frequently found to disagree with each other from one fourth to three fourths of a point; the consequence, most probably, of the different local attraction to which they were exposed. These compasses ceased therefore to be attended to, except as an occasional assistance to the helmsman; and a position was selected in each ship, in which a compass on a more suitable construction was permanently fixed: by this the ship's course was directed, azimuths taken, and bearings of land, &c. noted during the voyage. This *standard compass*, as it may be called, was placed in the Isabella exactly a-midships between the main and mizenmast, on a stout cross beam, elevated nine or ten feet above the deck. This beam was the usual walk of the Greenland pilot, or of the quartermaster, as affording a better view of the ice, among which the ships were frequently steered, than from the deck. The elevation was an advantage to the compass in such high magnetic latitudes, by rendering it less liable to accidental disturbance on the removal of such implements of iron as were required to be kept on deck for use. The Alexander not having a similar cross beam, her compass was fixed a-midships on a box of sand placed on the companion, between five and six feet above the deck.

Secondly, captain Flinders found that in his compass, permanently fixed as described, no error took place when the ship's head was on the magnetic north or south points, showing that at such times the attraction of the ship, and of magnetism, were in the same line of direction. The maximum of error also took place when the ship's head was at right angles to these points, namely, at east or west, being, however, in opposite directions; in excess of the true variation on the one side, and in defect on

the other; so that the extreme difference occasioned by altering the course from east to west on the reverse, would be twice the error at either.

On the intermediate points, the ratio of the error to its maximum was as the "Sine of the angle between the ship's head and the magnetic meridian to the sine of eight points or radius," or sufficiently near to admit of corrections being calculated for every course, when the error on a single one was known by observation.

Thus far the experiments which captain Flinders tried in every ship corresponded, excepting only that the maximum of error in different ships at the same place would differ materially. The accordance in so many ships gave him reason to believe that in compasses, placed near the binnacle, and a-midships, *the points of no error* would be most commonly those of the magnetic meridian. Considering, however, that this must depend altogether on the distribution of iron, and may be therefore liable to great diversity; he recommends, that in every ship, as soon as a fixed position has been selected for a compass, the points of no error should be determined by repeated observation. The method that was adopted for this purpose in the late voyage appearing both simple and effectual, it may be useful to exemplify it by an instance or two.

The Isabella being at anchor in Brassa Sound, Shetland, her head was placed, by means of warps, on each point of the compass successively, and the bearing of a pile of stones on the summit of a distant hill, noted by her compass at each point. At the same time that these observations were made on board, her bearing from the hill was also observed by a compass, placed on a pile of stones, the agreement in bearing showed the point of no error, and the differences the errors in each point, without the calculations which azimuths involve.

TABLE

Of the Errors in the Isabella's Compass, Shetland.
Dip, 74° 21′.

Direction of ship's head.	Deviations.	Direction of ship's head.	Deviations.
North.	+ 1° 26′	North.	+ 1° 26′
N. by E.	+ 0 26	N. by W.	+ 2 26
N.N.E.	— 0 19	N.N.W.	+ 3 26
N.E. by N.	— 1 19	N.W. by N.	+ 4 26
N.E.	— 2 9	N.W.	+ 5 11
N.E. by E.	— 3 4	N.W. by W.	+ 5 46
E.N.E.	— 3 34	W.N.W.	+ 5 46
E. by N.	— 4 4	W. by N.	+ 5 41
East.	— 4 34	West.	+ 5 11
E. by S.	— 5 34	W. by. S.	+ 4 11
E.S.E.	— 5 34	W.S.W.	+ 3 56
S.E. by E.	— 5 34	S.W. by W.	+ 2 56
S.E.	— 4 59	S.W.	+ 1 11
S.E. by S.	— 4 24	S.W. by S.	+ 0 26
S.S.E.	— 3 34	S.S.W.	— 0 0
S. by E.	— 3 4	S. by W.	— 1 34
South.	— 2 4	South.	— 2 4

The Alexander being alongside of a floe, or field of ice, in Baffin's Bay, the true magnetic bearing from the ship of a very distant and defined object on the main land, was found by carrying a compass on the ice in an opposite direction, to a distance which insured its being perfectly free from local influence, the ship's head being then warped round to each point of the compass successively, the errors in each were determined by the differences in bearings, as in the last instance.

TABLE

Of the Errors in the Alexander's Compass, Baffin's Bay, lat. 75° 25′ north, long. 56° 26′ west.
Dip of the Needle 84° 30′; variation 87° 30′ west.

Direction of ship's head.	Deviations.	Direction of ship's head.	Deviations.
North.	— 4° 39′	South.	+ 6° 46′
N.N.E.	— 4 9	S.S.W.	+ 4 46
N.E.	— 3 44	S.W.	+ 3 20
E.N.E.	— 2 24	W.S.W.	+ 3 11
E. by N.	— 2 14	W. by S.	. . . .
East.	— 1 44	West.	+ 1 41
E. by S.	+ 0 6	W. by N.	. . . .
E.S.E.	+ 0 56	W.N.W.	— 0 19
S.E.	+ 2 51	N.W.	— 1 44
S.S.E.	+ 4 1	N.N.W.	— 3 9

The regularity in the above results is the best testimony that the method is a satisfactory one.

Certain precautions must be attended to: thus, the object must be sufficiently distant, that the space occupied in warping the ship round may not subtend any sensible parallax. The direction of the ship's head should be noted by the compass by which the bearings are taken. A short time must be allowed to elapse after the ship is steady on any point, to insure the traversing of the cards. This is particularly necessary in high latitudes, when the compasses move very sluggishly. And lastly, the observations should be repeated.

It will be observed by the above results in the Isabella and Alexander, that the points of no error were not coincident in either ship with those of the magnetic meridian. In the Alexander, especially, they were more nearly at right angles to it. That this ship should have differed so materially from all the instances on record, may be attributed to her compasses being so near the level of the deck, and therefore being more affected by the influence of a considerable quantity of iron articles (such as ice anchors, ice saws, &c.) which were carried on the after part of the deck for convenience in use, than it would have been, had it been raised higher. This was proved by placing a compass on a plank elevated for experiment in front of the companion to the same height as in the Isabella, namely, nine or ten feet. The points of no error were found in this position to be about north and south, and the amount of error at eight points nearly twenty degrees, the same as in the Isabella; the greatest error at the same time by the Alexander's standard compass, viz. the one nearer the decks being 8° 20′ N. N. E.: the dip was 84° 9′.

The propriety of captain Flinders's recommendation to determine the points of no error in a fixed compass, by actual observation in every ship, as soon as the distribution of iron is completed, may therefore be considered as confirmed by the observations in the Isabella and Alexander, whilst his rule of proportion may receive a verbal alteration to render it more suitable for general application; so corrected, it would be as follows: the expression suitable being marked in italics, and the original words entered in the margin.

	"The error produced in any direction of the ship's head, will be the error at *the*
East or west	*point of the greatest irregularity*, as the sine of the angle between the ship's head
Magnetic meridian.	and *the points of no error* to the sine of eight points, or radius."

Thirdly, captain Flinders's experience in the Investigator

showed the maximum of error in the same compass would be different in different parts of the world, although the use of the compass was confined to one particular spot in the ship, and every precaution taken to avoid an interference with the distribution of the ship's iron.

It is worthy of remark, that by multiplying observations, and by comparing the series one with another, he was thus practically led to trace a connexion between the amount of the errors and the dip of the needle; a knowledge of the fact preceding, in his mind, any theoretic suggestion that such might be the case.

It does not appear, indeed, that the principal cause of this connexion was even subsequently known to him; he perceived that the influence of local attraction on the compass-needle increased as the dip became greater.

He endeavoured to account for this circumstance on a supposition that all iron might receive an absolute increase in the intensity of its attractive power by approaching the magnetic pole.

The increase, however, which was the subject of his observation, was a relative one, being in comparison to the directive power of magnetism. A diminution in the latter would therefore produce the effect equally with an absolute augmentation in the former; and that such a diminution does take place, and in a degree which is sufficient to account for all the effects observed, will be evident to every person, who reflects that although the magnetic force is greatest at the pole, its directive power must then have wholly ceased, having become less on the horizontal traversing of the needle, in proportion as the point of attraction has been brought beneath the compass, indicated by the angle which the dipping needle makes with the horizon. This is doubtless the principal cause of the connexion which captain Flinders was the first to trace.

It is not designed to say that this cause may not be aided by the increased magnetism of portions of the ship's iron, such as bars and stanchions; which being fixed in an upright position, may receive an addition to their attractive power, where the position of the dipping needle is always coincident with theirs; but merely to observe, that a cause is known to exist for the connexion, independently of supposition; which cause, conjointly with experience, shows the inadequacy of the rule proposed by captain Flinders, whereby the amount of error, under any known dip, being ascertained, the amount may be calculated for any other dip, using as a multiplier the decimal expression of the proportion which the error in the one ascertained instance may have borne to the dip.

In the observations made in the Isabella, at Shetland, where

the dip is 74° 21¼′, the maximum of error was 5° 34′ easterly of the true variation, with the ship's head at E. S. E., and 5° 46′ westerly at W. N. W., making an extreme difference of 11° 20′. By captain Flinders's rule, the common multiplier for this compass would have been about one twelfth on .083; which, at a dip of 86° 9′, which was the greatest observed during the late voyage, would have given an error of between 7° and 8°, making the extreme difference 15°; whereas repeated observations showed it to be at that time more nearly 50°, if not exceeding that amount. The inadequacy of the rule will also appear by reference to the observations made in the Alexander in Baffin's Bay. The error at eight points being 6° 46′ at a dip of 84° 30′; it ought scarcely to have exceeded 7° at the greatest possible dip, making an extreme difference of less than 15°. No opportunity occurred indeed of making accurate observations at a greater dip than the above; but the difference in the bearing of objects before and after tacking, indicated with sufficient certainty that the error had increased to an amount of very far beyond 15°: frequent instances of an extreme difference of from three to four points being remarked as the ship approached the farthest western longitude, to which she attained in a high latitude. This was in Lancaster's sound of Baffin's Bay, into which inlet the expedition sailed beyond the 81° west longitude in the parallel of 74° and a few minutes.

It is much to be regretted that the service did not admit an opportunity to be afforded of making observations on the various magnetic phenomena, with the excellent instruments supplied to the expedition, at this very interesting place, where a nearer approach was made to one of the magnetic poles than had ever been known before. But in the absence of any actual observation on the dip of the needle, this fact of the error of the compasses having increased from local attraction so greatly beyond the amount which had been before observed, is worthy of notice, as affording an indication that the dip had also increased, and not inconsiderably. The greatest which was observed was 86° 9′; and, after this observation, the ships continued to sail for six days in the direction in which the dip had hitherto been found to increase.

In concluding this paper, it may be permitted to remark, that it is to the voyages of discovery undertaken during the reign of his present majesty, that a knowledge of the extent and causes of the errors to which a compass is subject in ships, is to be principally attributed, as well as the steps that have been taken towards the investigation and remedy of the inconvenience they occasion to practical navigation. The care and exertions of captain Flinders, in collecting observations for this purpose, give his opinions and rules a peculiar claim to atten-

tive consideration, no one could have been more fully persuaded than he was that a rule, founded on the effects experienced in a few ships, would require a far more extensive trial, before it could be depended on for general application. To carry this on, therefore, is to follow his useful examples and to effect what he was desirous to have done himself, had his life been spared."

ON

NATURAL PHILOSOPHY

USEFUL

TO

SEAMEN.

On Magnetism.

THE loadstone, or leaden stone, or natural magnet, is an iron ore, or ferruginous stone, found in the bowels of the earth, generally in iron mines, of all forms and sizes, and of various colours. It is endued with the properties of attracting iron, and of pointing to the poles of the earth. It has also the power of communicating these properties to a needle, touched upon it, and duly poized.

Loadstones are, in general, very hard and brittle, and, for the most part, more vigorous in proportion to the degree of their hardness. Considerable portions of iron may be extracted from them. Newman says, they are almost totally soluble in spirits of nitre, and partially so in vitriolic marine acid.

The artificial magnet, made of steel, is now generally used in preference to the natural magnet.

The power of attracting iron, &c. possessed by the loadstone is communicable to iron and steel, and is called magnetism.

A rod or bar of iron or steel, to which a permanent polarity has been communicated, is called a magnet.

The points of a magnet which seem to possess the greatest power, or in which the virtue seems to be concentrated, are termed the poles of the magnet.

The magnetical meridian is a vertical circle in the heavens, which intersects the horizon in the points to which the magnetical needle, when at rest, is directed.

The axis of the magnet is a right line which passes from one pole to the other.

The equator of a magnet is a line perpendicular to the axis of the magnet, and exactly between its poles, from which it is equidistant.

The distinguishing characteristic properties of a magnet are, first:—its attractive and repulsive powers; secondly:—the force by which it places itself, when suspended freely, in a certain direction towards the poles of the earth; thirdly:—its dip or inclination towards a point below the horizon; and fourthly:—the property which it possesses of communicating the foregoing properties to iron and steel.

There is a point between its two poles, where the magnet has neither attraction nor repulsion. This point is called the magnetic centre; though it is not, in all instances, exactly equidistant from the two poles. The nature of this phenomenon is pleasingly illustrated by carrying a small dipping-needle from one end of the magnetic bar to the other. When it is over the south pole, its north end will be directed perpendicularly to it. As the needle is moved, the dip will grow less; and when it comes to the magnetic centre, it will be parallel to the bar. After this point is passed, the south end will dip, and when directly over the north pole of the bar, the needle's south pole will stand perpendicular to it.

The Dip of the Needle.

IF a needle, which is accurately balanced, and suspended so as to turn freely in a vertical plane, be rendered magnetical, the north pole will be depressed, and the south pole elevated above the horizon. This property is called the dip of the needle. As it is very difficult to balance a needle accurately, the poles are generally reversed by a magnet, so that they may dip alternately, and the mean of the two taken. This property was discovered by Robert Norman, a compass-maker, in London, in 1576.

The dip is subject to variation. At this time, at London, it is 72½ degrees. From some late observations it appears to diminish 15 minutes in four years; and it is found to be different in different places. Observations on the dip of the needle are given on a small variation chart, published by Laurie & Whittle, London.

The contrary north and south poles of two magnets attract each other's poles. The poles of the same name, as two north or two south poles, repel each other. The reason of this phenomenon is, that, by the approach of the north pole of a magnet,

in the first case, the extremity of the iron bar which is nearest to it, acquires a south polarity, and of course the opposite extremity acquires a north polarity, in consequence of which the needle is repelled.

The magnetism acquired by soft iron, when placed within the influence of the magnet, lasts only while it continues in that situation, but disappears as soon as it is removed; but with hard iron, and particularly with steel, the case is quite different; for the harder the iron or steel is, the more permanent is the magnetism which it acquires; but in proportion to its hardness is also the difficulty of rendering it magnetic.

Magnets should never be left with their north or south poles together; for, when thus placed, they destroy each other's magnetism. They should, therefore, always be left with their opposite poles against each other.

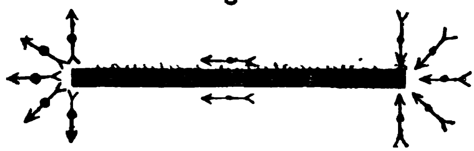
The magnetic power of a loadstone, if unused, will decay in time. A small piece of iron or steel should therefore be placed at each of its poles. This will not only retain, but increase its power.

If a magnetic bar be broken into two parts, each part becomes a magnet, having two poles: the end of each, next to where it was broken, acquiring a polarity contrary to the other.

Place a magnetic needle upon one of the stands, and, when the needle is steady, place an iron bar, eight inches long, and from a quarter of an inch to an inch thick, upon a stand, so that one end of it is on one side of the north pole of the needle, and so near it as to be drawn a little way out of its natural direction. In this situation, gradually approach the north pole of the magnet to the other extremity of the bar, and you will find the needle's north end to recede from the bar, more and more in proportion as the magnet is brought nearer to the bar. If the experiment be repeated with only this difference, that the south pole of the magnet be directed towards the iron bar, then the north end of the needle will advance nearer and nearer to the bar, in proportion as the south extremity of the magnet is brought nearer to the iron.

The effects of magnetism may be pleasingly exhibited by surrounding a magnet with small compass-needles. Arrange them along the bar, and those near the ends will incline towards the poles; but the needles at or near the middle of the bar will be parallel thereto, not inclining to either pole; the north pole of the magnet attracting the south poles of the needles, and the south pole of the magnet the north poles of the needles; thus:

Fig. 29.



Lay a number of magnetic bars in a straight line, with their north and south poles together: pass the dipping-needle* over them, and you will find a magnetic centre at each place of contact. The union of the two powers distinguish their attraction. Separate them, and you will have the north and south poles, as at first.

When a piece of iron, or any other substance that contains iron, is brought within a certain distance of the magnet, its powers are separated, and it becomes a magnet, having two poles of contrary power, and every property of a real or natural magnet.

If a powerful magnet be placed near a watch or chronometer, it will stop its going; caution is therefore necessary if such thing be on board, not to place it near a chronometer.

Specific Gravity.

THE specific gravity of a body is its weight compared with that of any other body of the same bulk. A body, immersed in a fluid, will sink, if it be heavier than its bulk of that fluid. If it be suspended therein, it will lose so much of what it weighed in air, as its bulk of the fluid weighs; but a body which is lighter than the fluid, will displace only so much of it as will equal the weight of such body, and therefore will not sink to a level with the surface of the fluid. Thus a ship will displace just as much water as will equal her weight.

The specific gravity of a man, of moderate habit of body, is a little greater than that of water, but a small degree of exertion on his part will keep him from sinking. Some men are, however, said to be lighter than water, who can float on it without making any exertion. This is said to be the case with fat men, whose superabundance of flesh, which is much lighter than water, counterpoises the greater weight of the more solid

* The dipping needle is fixed with a kind of axle, so as not to unhang when it points downwards.

parts of their bodies. The specific gravity of bodies is ascertained by the use of the

* *Hydrostatic Balance.*

IN using this instrument, water is adopted as a standard for comparing the gravity of bodies. For this purpose pure rain or distilled water is preferred, but in ordinary cases common clear water will answer. The gravity of water may be represented by unity, or 1, or in case great accuracy be required, by 1.000, where three cyphers are annexed, to give room to express the ratios of other gravities in larger numbers, or fractional parts, in the table. In doing this there is a twofold advantage: the first is, that by this means the specific gravities of bodies may be expressed to a much greater degree of accuracy; the second is, that the numbers of the table, considered as whole numbers, do also express the ounces avoirdupois contained in a cubic foot of every sort of matter therein specified; because a cubic foot of common water is found, by experiment, to weigh very nearly 1000 ounces avoirdupois, or 62½ pounds.

The construction of the Hydrostatic Balance differs very little from that of a common balance that is nicely made. Its beams are in general from eight to ten inches long, and, with the perfections necessary to a good balance-beam; it either rests on a stand or fulcrum, or is pendant. To this beam are adjusted a pair of scale-pans, which may be taken off at pleasure. There is also another smaller pan, of equal weight with one of the others, furnished with shorter strings, so as to admit of a vessel of water to be placed under it. When the balance is used for hydrostatic purposes, this pan is to be suspended at one end of the beam, and one of the common scale-pans at the other end. A glass bucket is to hold any solid body to be weighed in water, and is to be suspended by a horsehair to the hook at the bottom of the small scale. A weight is to be placed in the opposite scale, to balance the bucket exactly in water.

In order to ascertain the specific gravity of a body, weigh it first accurately in air, setting down its weight in grains and decimal parts; then hang on the small water-scale to one end of the beam; place it under the glass vessel, pouring water in till it be filled to within three quarters of an inch from the rim; place the body to be weighed in the bucket, tongs, or nippers, as is most convenient, and immerging it in water, let it be suspend-

* The word *Hydrostatics* implies simply the science which relates to the weight of water compared with that of other bodies.

ed by a horsehair to a hook at the bottom of the water-scale. Take care that the same weights that balance the body in air be in the opposite scale (and also the proper water-weights,) and that no air-bubbles adhere to any part of the substance in the water; which will render it apparently lighter. The opposite scale to that which contains the substance will now greatly preponderate. Weights should therefore be put into the water-scale till the equilibrium be restored. Divide the weight in air by its loss in water; that is, divide the number of grains in the large scale by those in the small one, and the quotient will show the specific gravity, or how much heavier the substance weighed in air than in water. If the weight in the small scale be subtracted from that in the other, it will show the relative gravity of the substance weighed, or the weight with which it will be evenly balanced in water.

On the Method of Weighing Substances which are lighter than Water.

SUPPOSE it was required to find the specific gravity of a piece of beech wood. Having set down the weight of the wood in air, fix it in the tongs, and suspend the whole to the water-scale, placing the balance-weight of the tongs in the opposite scale; let the weights with which the substance was weighed remain in the scale; then take out all except the balance-weight, and upon immerging the tongs and wood into the water, they will appear to be lighter than the tongs alone. That adding a weight to one end of the scale-beam should make the other preponderate, seems to be as paradoxical as the weighing of levity; but it ceases to be so, when we consider that no bodies ascend by means of their levity, but by reason of the greater density of the medium in which they are immersed. The wood pulls the tongs upwards with a force equal to the respective gravity of the water; so that it requires as much to restore the equilibrium as the wood is lighter than its bulk of water. Small weights are therefore to be put in the water-scale till the balance be even; and the weight of the wood in air, added to these small weights, will be equal to the weight of a bulk of water of the same size as the wood; consequently the specific gravity will be as the weight of such a bulk of water is to the weight of the wood in air.

To find the specific gravity of any kind of fluid, weigh a quantity of it against an equal quantity of water.

Use of the Hydrostatic Balance in determining the Quality of Gold.

BY means of this instrument counterfeit coin which may be offered as gold will be easily detected. The principal distinguishing quality of good gold is the simplicity of the cohesion of its parts, and its consequent superior weight to that of any other metal with which it can be plausibly and profitably adulterated. It follows from hence that if gold be adulterated with any other metal, its specific gravity or comparative weight must be less in proportion to the quantity of alloy: the *weight*, therefore, of gold, is a sure criterion by which to determine its quality and real value. If a guinea, suspended in air, be counterbalanced by 129 grains in the opposite scale; and then, upon being immersed in water, it requires 7¼ grains to be put into the scale over it to restore the equilibrium, it shows that a quantity of water of equal bulk with the guinea weighs 7.250 grains, by which divide 129 (the weight of the guinea in the air,) and the quotient will be 17.793; which shows that the guinea is 17.793 times as heavy as its bulk of water.

Thus may any piece of gold be tried; and if, upon dividing the weight in air by the loss in water, the quotient comes out 17.793, the gold is sterling; if the quotient is a larger number, the gold is proportionably finer, and consequently more valuable; but if the quotient be less than 17.793, the gold is too much alloyed, by being mixed with some baser metal.

The specific gravity of pure or refined gold is found to be 19.640; but it is seldom met with. In coin it is always alloyed, and its standard, as sterling gold, is 17.793. If therefore a guinea, weighed in water, is found to lose more than 7¼ grains of its weight in air, the usual method has been to reckon it proportionably worse than sterling gold, by deducting from its value a certain sum for every grain that it loses more than 7¼: and perhaps a more correct method cannot be taken.

The specific gravity of fine silver is 11.091; that of British standard silver 10.535: A piece of this silver, of equal weight with a guinea (129.4 grains) when weighed in water, loses of its weight 12.47 grains; which is 5.2 more than a guinea loses: (and as 5.2 is to 252 pence, so is 148.4 pence). If therefore a guinea, or other piece of gold coin, be adulterated with silver, four shillings must be deducted, at least, from its value, for every grain that it loses more than it would were it sterling gold.

A piece of copper, of equal weight with a guinea, loses in water 14.65 grains, which is 7.38 more than a guinea loses. Therefore as 7.38 is to 252 pence, so is 1.34 pence.

So that if sterling gold be adulterated with copper, two shillings and two pence are to be deducted from its value for every deficient grain. The same method will ascertain the proportion for every other species of alloy.*

Counterfeit guineas are seldom found to be adulterated with silver alone, but more generally with copper, with a small quantity of silver, or with metals whose weight is nearly equal to that of copper. From the mean weight of these metals, compared with different assays that have been made of counterfeit gold, it appears that if three shillings be allowed for every grain deficient in the specific gravity, it will come very near the real value of the coin, and may be generally relied on as sufficiently correct.

The following table exhibits the specific weights of the various substances contained in it, discovered by some of the methods already described; and the absolute weight of a cubic foot of each body is ascertained in avoirdupois ounces, by multiplying the number opposite to it into 1000; as for example, S G of water: S G of mercury : : I : 14.019 : : 1000oz. weight of a cubical foot of mercury; which is therefore equal to 1000 × 14.019 avoirdupois ounces.

There are some uncertainties in this subject, for substances of the same kind, though denominated by the same name, may not be precisely similar; and some small errors may perhaps be inevitable in physical experiments: but they will be inconsiderable if the scales be nicely adjusted, and the experiments be cautiously conducted, so that the body weighed do not touch the bottom or sides of the vessel, nor rise above the surface of the fluid, nor bubbles of air adhere to its surface. There is another cause of uncertainty; for most substances are dilated by heat, and contracted by cold, and the dimensions of the same body, and consequently its specific gravity are different, according to the different temperatures of the ambient air; and the altitude of the thermometer ought to be considered in constructing a table of specific gravities.

* Hiero, king of Sicily, ordered his jeweller to make him a crown, containing sixty-three ounces of gold; the workman thought, by substituting part silver therein, to have a proper perquisite. Archimedes was appointed to examine it, who, on putting it into a vessel of water, found it raised the fluid; or that, itself contained 8,2245 cubic inches of metal—and having discovered that the cubic inch of gold weighed 10.36 ounces, and that silver but 5.85 ounces, he by calculation found what part of the king's gold had been changed.

The Hydrostatic Balance would be very useful to persons going to places where gold is to be procured from the natives, such as the west coast of Sumatra and the west coast of Africa. It may be easily procured, as well as tracts on its use.

The following table exhibits the specific gravity of some of the bodies ascertained by the use of this instrument.

Table of Specific Gravities.

Select pieces of platinum,	27.500	Stone, of mean gravity,	2.500
Platinum cupelled with lead,	19.240	Chalk,	2.470
Platinum rendered malleable, and hammered,	20.170	Selenites,	2.252
Refined gold,	19.640	Sal gemmæ,	2.143
British standard gold,	18.888	Brick,	2.000
Guinea gold,	17.793	Nitre,	1.900
Moidore gold,	17.140	Alabaster,	1.875
Platinum from the mine,	16.995	Dry ivory,	1.825
Mercury distilled,	14.019	Brimstone,	1.800
Pure lead,	11.325	Dantzic vitriol,	1.715
Refined silver,	11.091	Alum,	1.714
British standard silver,	10.535	Borax,	1.714
Bismuth,	9.700	Calculus humanus,	1.700
Copper from Japan,	9.000	Oil of vitriol,	1.700
Copper from Sweden,	8.843	Oil of tartar,	1.550
Hammered brass,	8.349	Bizoar,	1.500
Turbeth mineral,	8.235	Honey,	1.450
Cinnabar, factitious,	8.200	Lignum vitæ,	1.367
Cast brass,	8.100	Gum arabic,	1.375
Elastic steel,	7.820	Lignum guiacum,	1.337
Soft steel,	7.738	Spirit of nitre,	1.315
Iron,	7.645	Aquafortis,	1.300
Pure tin,	7.471	Aqua regia,	1.244
Cinnabar, natural,	7.300	Pitch,	1.150
Glass of antimony,	5.280	Spirit of salt,	1.130
A pseudo topaz,	4.270	Crassamen of human blood,	1.126
Diamond,	3.400	Spirit of urine,	1.120
Crystal glass,	3.150	Oil of sassafras,	1.099
Asbestos,	2.943	Human blood,	1.054
Iceland crystal,	2.720	Amber,	1.050
Fine marble,	2.707	Canary wine,	1.043
Rock crystal,	2.650	Milk,	1.040
Talc,	2.654	Serum of human blood,	1.030
Common glass,	2.620	Urine,	1.030
		Dry box wood,	1.030
		Sea water,	1.030
		Common water,	1.000

Those which follow, being lighter than water, will of course float on its surface.

Camphor,	0.996	Rectified spirit of wine,	0.866
Port wine,	0.993	Dry ash,	0.800
Bees-wax,	0.955	Dry maple,	0.755
Linseed oil,	0.942	Alcohol,	0.742
Dry oak,	0.925	Dry elm,	0.600
Olive oil,	0.918	Dry fir, or pine,	0.550
Proof spirits,	0.925	Cork,	0.240
Spirit of wine,	0.876	Air,	0.0011
Spirit of turpentine,	0.874		

—

To find what quantity of water must be added to a given quantity of spirits to reduce it to standard proof.

Specific gravity of standard spirits, 925

Do. do. of water, 1000

A retailer has 120 gallons of rum, the specific gravity of which is 900. How much water must be added to reduce it to standard proof?

	1000	925
Standard spirits,	925	900
	75	25

	Gall's of Rum.		Gall's of Water.		Gall's of Rum.		Gall's of water.
As	75	is to	25	so is	120	to	40 to be added.

The above rule is subject to variation. The specific gravity of liquor is less in summer than in winter; for which reason those who prove spirits make use of a thermometer with the hydrometer, to ascertain its temperature.

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Required to know how much water must be added to 120 gallons of rectified spirits of wine, the specific gravity of which is .850.

	1000	925
Standard spirits,	925	850
	75	75

	Sp'ts of Wine		Water.		Sp'ts of Wine.		Gallons.
As	75	is to	75	so is	120	to	120, quantity of water to be added.

—

What is the specific gravity of the best French brandy, consisting of five parts measure of rectified spirits of wine, and three parts water.

$$
\begin{array}{r}
850 \times 5 = 4250 \\
1000 \times 3 = 3000 \\
\hline
5 + 3 = 8\ )7250 \\
\hline
906.25
\end{array}
$$
specific gravity.

Knowledge of Specific Gravities useful to Seamen.

A KNOWLEDGE of the specific gravity by seamen might be the saving of many valuable lives. Many leaky vessels have been abandoned at sea by their crews, who, after pumping for some time, and finding the water still gaining on them, have taken to their boats, for fear of going down with their vessels. Many such ships have been afterwards met with, and taken into port by other vessels. A few of these crews have been picked up at sea, and some have reached the shore in safety with their boats: but a great majority of them have never been heard of. It is, therefore, in the highest degree, adviseable for a commander to ascertain, with certainty, whether his vessel may not be kept above water by the pumps, or by her own buoyancy, before he and his crew hazard their lives in an open boat.

When a vessel springs a leak, the water rushes into her hold with all the force of the pressure of the column of water, which force is in proportion to the difference between the level of the water without and that within the vessel, and also in proportion as the leak is nearer to her bottom. If it be near the surface, it may, in most cases, be got at. The result is, that the water enters in greater quantity at first than it does afterwards; and as the quantity entering becomes less and less, as the surfaces of the water without and that within become more nearly equal in height, the pumps, which could not keep the water from gaining at first, might afterwards prevent its gaining any more, and the people might remain in safety, and, by sending down the top-gallant masts and top masts, and by carrying sail on the lower masts, might perhaps bring her safe into some port.

N. B. In proportion as a vessel becomes filled with water, the more crank will she be.

There may be also other causes which would prevent a leaky vessel from sinking. Many bodies which compose a ship's cargo may be lighter than water. All these, when out of water, are an additional weight to the ship; but, as soon as they are immersed, they help to buoy her up, in proportion as they are light. The ship's water-casks, if carefully bunged, after being emptied, would be a considerable advantage. In a ship of war,

in particular, where the number of water-casks must be great, they might prevent her from sinking in an engagement or afterwards.

Some cargoes are, however, so much heavier than sea-water, that, when the leak gains fast, it would be prudent to get into the boats, if they are prepared, and wait the event, as in such case the vessel might leave the crew on the surface of the water.

If it is seen that the water gains on the pumps, and that the nature of the cargo will not allow the ship to sink; but the vessel will not stop leaking till nearly full of water, the masts should be immediately cut away, not only to lighten the vessel, but to prevent her from upsetting, which she surely would with the masts standing.

On Gravitation, or Attraction of Gravity.

IT requires no experiment to show the attraction of gravity; for, since the earth is in the form of a globe, it is manifest that it must be endued with the power of attraction, to keep upon its surface the various bodies which exist there, without their being hurled away into the immensity of space, in the course of its rotatory daily motion. This is the true cause of weight or gravity. We know by experience, that the weight or gravity of a body or thing is not always in proportion to its bulk; as a ball of lead is much heavier than one of wood of the same size, and a ball of gold much heavier than one of lead of the same size. It is reasonable, therefore, to suppose, that a ball of gold or lead contains a greater number of solid particles, which are united and pressed together, than those of wood.

Attraction of Cohesion.

THE attraction of cohesion is observable in almost every natural object. It is that power which holds their particles together; which may be exemplified by the following experiment:—Take two leaden bullets; pare a piece off the side of each, and make the surfaces, where thus cut, perfectly flat and smooth; then press them together, and you will find them to cohere or stick together so strongly, by their mutual attraction, that they cannot be separated, unless cut asunder. If they should not be at first sufficiently smooth, rub them for a little while together, and they will become so smooth and parallel to each other, that

the air will be completely excluded from between them. The air, wherever it is admitted, keeps the particles of two bodies asunder, and thereby prevents their cohesion. This cohesive power may also be proved by pressing together the smooth surfaces of two pieces of glass, having previously placed between them a little oil, or other moisture, to fill up all the little spaces in which the pieces of glass do not come in contact, and to exclude all air; in which case they will strongly cohere.

It is by the attraction of cohesion that an anchor with a wooden stock holds better than one with an iron stock, although the wooden stock is much lighter than that of iron; the former, having the greater surface, cohering with the bottom so closely, no air being admitted between them, that it is often very difficult to raise them, more particularly on a clayey bottom.

Vis Inertia.

IT is from the sluggishness of motion, which is called the *vis inertia* of bodies, that there proceeds a something like an endeavour in all bodies to preserve that state in which they are; when at rest, to continue in a state of rest; and when in motion, to continue in motion. This position may seem strange; but it will admit of illustration by the most common facts. If I push a bowl of water with my hand, the water will fly backwards over the edge, on my hand; for it endeavours to continue in the state of rest in which it was before; but, if I take the bowl in my hand, and run with it, and then suddenly stop short, the water will fly forward the way I was running, from its tendency to continue in a state of motion. If I sit in the front of a carriage, which, after going very fast, suddenly stops, I am in the same manner jolted from my seat, and my head will possibly drive through the front glass of the carriage. If a bullet, or any heavy substance, be dropped from the mast-head of a ship, under swift sail, it might be supposed that, before it would fall its distance from the deck, the ship would leave it so far behind, that it would drop astern into the sea: but this is not the fact, It falls down close to the mast, as it would, if the ship was at anchor; because it receives a horizontal force from the horizontal motion of the ship, which is just equal to that which it would receive from being sent forward by your hand with the same degree of velocity as that at which the ship moves; and it is at the same time acted upon perpendicularly by the power of gravity; so that, though it appears to fall perpendicularly, it does

not; but describes in space the same kind of semi-parabola, or curve that is described by a ball shot from a gun.

Action and Reaction being Equal.

REACTION is always equal to action. For instance: if an anvil is struck with a hammer, the anvil, in its reaction, strikes the hammer with the same force with which it is itself struck. It is a common trick in the country, for a man to lie on the ground, with an anvil on his breast, and to suffer a strong man to strike it with a sledge-hammer with all his might. If the anvil is very large, its vis inertia resists the force of the blow, and the man is perfectly safe: but if the anvil were very small, the first blow would probably kill the man; as its vis inertia, not being sufficient to resist the blow, it would, notwithstanding its equal reaction, communicate the action of the blow to him; as two bodies of equal weight and equal elasticity, meeting each other with the same velocity, will, by their reaction, mutually rebound from each other to equal distances.

It is on this principle that the recoil of a heavy cannon is less than that of a light one, with the same quantity of powder, as its vis inertia is greater in proportion to its greater weight.

On the Centre of Gravity.

THE centre of gravity is a point of a body in which the whole force of its gravity or weight is united. Whatever, therefore, supports that point, bears, in fact, the whole weight of that body; and while it is supported the body cannot fall; because all its parts are in perfect equilibrium about that point. Thus, if I endeavour to balance my cane, by laying it across my finger, after some time I find a place where neither end will preponderate. The part then which rests on my finger is the centre of gravity. If an iron ball be fixed to each end of an iron rod, the rod being of equal weight from one end to the other, and the balls of equal weight, the centre of gravity, in this case, would be exactly in the middle of the rod, between the two balls. If one ball should be a little heavier than the other, the centre of gravity would be found a little nearer the heaviest ball; but one ball might be so proportionably heavier than the other, that the centre of gravity would be found within the body of the largest ball, so that if that

ball be put perpendicularly to the ground, it would support the rod and the smaller ball in an upright position.

The stability of vessels greatly depends on properly placing the centre of gravity of their cargoes, which should always be below the centre of motion.

On the Atmosphere.

THE earth is surrounded by a thin fluid mass of matter, called the atmosphere. This matter gravitates towards the earth, revolves with it in its diurnal motion, and goes round the sun with it every year. Were it not for the atmosphere, which abounds with particles capable of reflecting light in all directions, only that part of the heavens in which the sun is placed would appear bright, or the sun would appear like a ball of fire placed in the midst of darkness, and the stars and planets would be visible at noonday; but by means of an atmosphere, we enjoy the sun's light, (reflected from the aerial particles contained in the atmosphere) some time before he rises, and after he sets; for on the 21st of June, at London, the apparent day is 9′ 14″ longer than the astronomical day.

This invisible fluid extends to an unknown height; but if, as astronomers generally estimate, the sun begins to enlighten the atmosphere, in the morning, when he comes within 18° of the horizon of any place, and ceases to enlighten it when he is again depressed more than 18° below the horizon, in the evening, the height of the atmosphere may probably be calculated to be near 50 miles. Notwithstanding this great height of the atmosphere, it is seldom sufficiently dense, at the distance of two miles from the surface of the earth, to bear up the clouds; and the higher we ascend the more thin and rare it becomes. This fluid body is extremely light, being, at a mean density, 816 times lighter than water. It is likewise very elastic, as the least motion excited in it is propagated to a great distance. It is invisible, for we are only sensible of its existence from its effects. It is capable of being compressed into a much less space than that which it naturally occupies, though it cannot be congealed or fixed, as other fluids may be; for no degree of cold has ever been able to destroy its fluidity. It is of different density in every part upwards from the earth's surface, decreasing in its density and weight the higher it rises. The weight or pressure of the atmosphere upon any portion of the earth's surface is equal to the weight of a column of mercury which will cover the same surface, and whose height is from 28 to 31 inches. This is proved by experiments on the barometer, which

seldom exceeds these limits. Now, if we estimate the earth's diameter at 7964 miles, the mean height of the barometer at 29 1-2 inches, and a cubic foot of mercury to weigh 1350 ounces avoirdupois, the whole weight of the atmosphere will be 11, 522,211,494,201,773,069 pounds avoirdupois, and its pressure upon a square inch of the earth's surface 14 2-5 pounds.

The atmosphere is the common receptacle of all the effluvia or vapours exuding from different bodies; viz. of steam, smoke of things melted or burnt, of fogs, or vapours proceeding from damp, watery places, of steam arising from the perspiration of whatever enjoys animal or vegetable life, and of their putrescence when deprived of it, and also of the effluvia proceeding from sulphureous and nitrous acids, and alkaline* bodies; all which ascend to greater or less height, according to their specific gravities. Hence the difficulty of determining the true composition of the atmosphere. Chemical writers, however, have endeavoured to show, that it consists of three distinct elastic fluids, united together by chemical affinity; namely, air, vapour and water, and carbonic acid gas,† differing in their proportions at different times, and in different places; but the average proportion of each, supposing the whole atmosphere to be divided into 100 equal parts, is given by Dr. Thomson, as follows:—98 3-5 air—2-5 water—and 1 carbonic acid.

Hence it appears that the foreign bodies which are mixed or united with the air in the atmosphere, are so minute in quantity, when compared with it, that they have no very sensible influence on its general properties; wherefore, in describing the mechanical properties of the air, in the succeeding part of this article, no attention is paid to its component parts, in a chemical point of view, but when the word *air* occurs, common or atmospheric air is always meant.

Air is not only the support of animal and vegetable life, but is the vehicle of sound; and this arises from its elasticity—for a body, being struck, vibrates, and communicates a tremulous motion to the air. This motion acts upon the cartilaginous portion of the ear, where there are several well contrived eminences and concavities, to convey it into the auditory passage, where it strikes on the drum of the ear, and produces the sense of hearing.

From the fluid state of the atmosphere, its great subtilty and elasticity, it is susceptible of the smallest motion that can be excited in it. Hence it is subject to the disturbing forces of

* Alkaline bodies are such as are fermented or putrefied, parts of plants, &c.

† Gas is a term applied by chemists to all permanently elastic fluids, except common air. Carbonic acid gas is what was formerly called fixed air, or such as extinguishes flame, and destroys animal life.

the moon and sun; and tides will be generated in the atmosphere similar to the tides in the ocean. By a continual motion of the air, noxious vapours, which are destructive to health, are in some measure dispersed, so that the air, like the sea, is kept from putrefaction by winds and tides. Air may be vitiated by remaining closely pent up in any place for a considerable length of time; and when it has lost its vivifying spirit it is called damp or fixed air, not only because it is filled with moist vapour, but because it deadens fire, extinguishes flame, and destroys life.

Nothing creates rot in the timbers of a vessel in a greater degree than this kind of air, which is generated by the hatches being kept long shut; but some cargoes, such as cause much heat in a ship's hold, generate it much more readily than others. I have often found the air in ships' holds, when the hatches were first opened, so impure, that candles would not burn in them, especially in ships laden with Indian corn. It is very dangerous to go into the holds of such vessels until a free circulation of air takes place in them. I have known several crews to have suffered dangerous effects from neglecting this precaution. Once in St. Sebastian's, I had my crew sick in the ship Orion, in going down the hold on first opening the hatches, when loaded with Indian corn.

If part of the vivifying spirit of air in any country begins to putrefy, the inhabitants of that country will be subject to an epidemical disease, which will continue till the putrefaction ceases; and as the putrefying spirit occasions disease, so, if the diseased body contribute towards the generation of putrefaction in the air, then the disease will not only be epidemical, but pestilential and contagious. Therefore great care should be taken not to suffer damp or confined air in ships' forecastles, particularly on long voyages. Nothing will create scurvy sooner. Plenty of fresh air is, I think, the best preventive of this disease.

The air will press upon the surface of all bodies, with any force, without passing through them or entering into them; so that the softest bodies sustain this pressure without suffering any change in their figure, and the most brittle bodies bear it without being broken. Thus the atmosphere presses upon the surface of water, and forces it up into the barrel of a pump. It also keeps mercury suspended at such a height as renders its weight equal to the pressure; and yet it never forces itself through the mercury into the vacuum.

Another property of air is, that it is expanded by heat, and condensed or contracted by cold. Hence fire, by rarefying and thinning the air in a chimney, causes it to ascend the funnels, while the air in the room, by the pressure of the atmosphere, and in its endeavour to preserve the equilibrium, is forced to

supply the vacancy, and rushes into the chimney in a constant stream, bearing the smoke into the higher regions of the atmosphere.

In large cities, in the winter, where there are many fires, people and animals, the air is considerably more rarified than in the adjoining country; for which reason continual currents of colder air rush in at all the exterior streets, bearing up the rarified and impure air above the tops of the houses and the highest buildings, and supplying their place with air of a more salubrious quality.

The more extensive winds owe their origin to the heat of the sun. This heat, acting upon some part of the air, causes it to expand and become lighter, and consequently to ascend, while the circumjacent air, which is more dense and heavy, will press forwards to the place where it is rarefied. Upon this principle we can easily account for the trade winds. But this subject will be treated of hereafter.

On the Pressure of the Atmosphere.

WATER will not flow unless exposed to the pressure of the atmosphere. This will be rendered plain by the following experiment:—Fill a cask with water or other fluid, let the bung be perfectly tight, and let there be no aperture above through which the air can press upon it, and an attempt to draw it off by opening a passage below, will be vain. Hence the use of a vent-hole in casks, by which air is admitted, which, by pressing on the liquor, causes it to flow out of the cock or fosset.

The syphon, or crane, is a bent tube, one leg of which is shorter than the other. With this instrument any fluid can be drawn off from a cask, well, or cistern; but in order to produce this effect it requires particular management, without which it will fail; for if the air, which presses on the surface of the fluid, also press through the bore of the tube, it will prevent its proper operation. In using it, therefore, it is necessary first to fill the crane with the fluid, and stopping both ends, immerse the shorter leg in the fluid contained in the vessel, when the fluid will flow out of the longer leg by its own gravity, and, by the pressure of the atmosphere on the surface of the fluid in the vessel, it will continue to flow until the whole is drawn off. If a vacuum is made in the crane, by drawing out the air with your mouth, or by any other means, the same effect will be produced.

On the Pump.

IT is by the pressure of the atmosphere that we are enabled to raise water by the common pump. The pump is said to have

been invented by a mathematician, of the name of Clesebes, about 120 years before Christ; but the principle upon which it acts was unknown until the seventeenth century. Before that time, there was a perfect ignorance that air had weight, and the phenomenon of the pump was attempted to be accounted for by a maxim, not only unfounded, but even destitute of meaning. This was that nature abhorred a vacuum. Absurd, however, as this maxim was, it remained uncontradicted 160 years, when it met with a practical refutation. About that time some workmen were employed by the Duke of Florence, to raise water, by a common sucking pump, to the height of 50 or 60 feet. A pump was accordingly constructed for that purpose; but after all their efforts, they were unable to raise it above the height of 32 feet. The matter was then referred to the famous astronomer and philosopher Galileo; but he was unable to solve the difficulty. It is, however, now explained. We know the pump is a hollow tube, to the bore of which the lower box is fitted; and in order to provide against a failure of its action, it ought not to be placed more than about 28 feet from the bottom, as the lightest pressure of the atmosphere on the water will raise it to that height in the bore of the pump, when the air is excluded from it. There is also an upper box, which is let down into the bore by means of an iron spear, the length of which spear is proportioned to the height which the water is required to be raised, so that the upper box may reach within two or three inches from the lower box. When the upper box is put down, the air or water contained in the chamber of the pump (which is the part which is above the lower box) will open the clapper of this box, while the clapper of the lower box remains shut; and when the upper box is drawn up, the pressure of the air or water which has been admitted through it, and is consequently above it, will keep its clapper shut, while that of the lower box, being opened, admits water into the chamber of the pump. By repeating this operation, the water is successively raised and discharged; for when the upper box ascends, it raises also a column of air which rests upon it, and causes a vacuum between it and the lower box: the air beneath, which is immediately over the surface of the water in the pump consequently expands, and forces its way through the lower box; the water, then, relieved from the pressure of the air, ascends into the chamber. A few strokes of the handle thus entirely excludes the air from the body of the pump, and fills it with water, which being raised as above stated, is discharged at the spout.

From what has been already stated, it is evident that a vent-hole in the pump, any where below the lower box, by which the external air can be admitted, will prevent the water from rising.

If a pump and its lower box be perfectly air-tight, and the water drawn up into it, it may be hoisted out of the well or ship's hold, with all the water which it contains. It is in this respect similar to the tin instrument called the valencia, used for drawing liquor from the bung-hole of a cask. This is a hollow tube, open at both ends: if, after it has been filled in the cask, the thumb is placed on the hole or aperture at the top, so as completely to exclude the air, it will retain the liquor until the thumb is removed.

Wooden pumps, which stand long unused, become dry and rent, and therefore useless; many of which have come under my notice. This may be prevented by frequently throwing water into them; pickle is, however, preferable for this purpose, as it keeps them longer damp, and prevents them from renting.

As a further proof of the weight of the atmosphere, nearly fill a common saucer with water; then burn a piece of paper in a tea-cup, and, while the paper is burning, turn down the cup, paper and all into the saucer, and the pressure of the air upon the water in the saucer will force it up into the cup.

Again—Take a glass tube, about three feet long, open at one end, and air-tight at the other; filling it with quicksilver, put the finger upon the open end; turning that end downwards, immerse it in a small vessel of quicksilver, so as not to admit any air into the tube; then take away the finger, and the quicksilver in the tube will not fall lower than to twenty-nine and a half inches above the surface of the quicksilver in the vessel, more or less, in proportion to the variation in the weight of the atmosphere.

That the quicksilver is kept up in the tube by the pressure of the atmosphere, may be proved by covering both the tube and the vessel by another glass vessel of sufficient capacity; and withdrawing the air from the smaller vessel by means of an air-pump, when the quicksilver in the tube will fall to the level of that in the small vessel; and, by again admitting the air, it will rise to the same height as before.

A column of quicksilver 29½ inches high, and one inch square, weighs just 15 pounds, which is equal to the pressure of the atmosphere upon every square inch of the earth's surface; consequently its pressure on every square foot is 2,160 pounds. At this rate, a middle-sized man, whose surface may be about 14 square feet, sustains a pressure of 30,240 pounds, when the air is of a mean gravity, a pressure which would be insupportable, and even fatal to us, were it not equal in every part, and counterbalanced by the spring of air within us, which is diffused through the whole body, and re-acts with an equal force against the outward pressure.

In the common barometer, the quicksilver in the bowl below is left open to the pressure of the atmosphere, which, in proportion as it increases in weight or density, presses more forcibly on the surface of the quicksilver, and forces it into the vacuum in the glass above. When the air is dense or heavy, it supports the clouds and vapours; when it is rare and thin, it is unable to support them, and they fall in the form of mists, rain, hail, or snow. When, therefore, the quicksilver rises in the glass, we say it is a sign of fair weather, and when it falls, it prognosticates foul weather.

Vapour.

VAPOURS are composed of watery particles, separated from the surface of the water, or moist earth, by the action of the sun's heat, whereby they are so rarefied and thinned, and separated from each other as to become lighter than the air, and consequently they rise and float in the atmosphere.

Fogs and Mists.

FOGS are a collection of vapours which chiefly arise from moist places, and become more visible as the light of the day increases. If these vapours be not dispersed, but unite with those that rise from rivers, lakes, &c. so as to fill the air, they are called mists.

Clouds.

CLOUDS are generally supposed to consist of vapours exhaled from the sea and land. These vapours ascend till they are of the same specific gravity as the surrounding air; and there they coalesce, and by their union become more dense and heavy. The more thin and rare the clouds are, the higher they soar; but their height never exceeds two miles. The generality of clouds are suspended at the height of about one mile. Sometimes, when the clouds are highly electric, their height is not above seven or eight hundred yards, or about one third of a mile. The variety of colours which is seen in them is owing to their particular situation in regard to the sun, and the different reflections of light.

Dew.

WHEN the earth has been heated by the sun, during the day, it will retain that heat some time after the sun is set. The air, being less dense, will retain the heat for a less time, so that in the evening the surface of the earth will be warmer than the air about it, and consequently vapours will continue to rise from the earth: but as these vapours come immediately into cooler air, they will rise only to a little height. As the rarefied air in which they begin to rise becomes condensed, their small particles will be brought nearer together; and when many of them are united, they form dew; and if this dew freezes, it becomes hoar frost.

Rain.

WHEN the weight of the air is diminished, its density will be also diminished, and consequently the vapour that floats in it will be less resisted, and begin to fall; and, as they strike one upon another in falling, they will unite, and form small drops. But when the drops of which a cloud consisted are united into such large drops that no part of the atmosphere is sufficiently dense to support them, they will fall to the earth, and constitute what is called rain. The drops of rain increase in bulk, as well as in velocity, during their descent, so that near the earth's surface, they are much larger than they are higher in the atmosphere.

Snow and Hail.

SNOW consists of such vapours as are frozen while their particles are small; for these stick together after they are frozen. The mass that is formed out of them will be of a loose texture, and form little flakes or fleeces of white substance, somewhat heavier than air, which therefore descend in a slow and gentle manner through it. Hail, which is a more compact mass of frozen water, consists of such vapours as are united into drops, and are frozen while they are falling.

Thunder and Lightning.

IT has been already observed, that the atmosphere is the common receptacle of all the effluvia or vapours arising from different bodies. Now when effluvia of sulphurous and nitrous

bodies meet each other in the air, there is a strong conflict or fermentation between them, which is sometimes so great as to produce fire. Then, if the effluvia be combustible, the fire will run from one part to another, just as the inflammable matter happens to lie. If the inflammable matter be thin and light, it will rise to the upper part of the atmosphere, where it will flash without doing any harm; but if it be dense, it will lie near the surface of the earth, where, taking fire, it will explode with surprising force, accompanied by terrible claps of thunder. The effects of thunder and lightning are owing to the sudden and violent agitation of the air, together with the explosion. Stones, struck by lightning, are often found in a vitrefied state. It is supposed that some stones in the earth having been thus struck, gave rise to the vulgar notion of the thunder-bolt. It is now generally admitted that lightning and the electric fluid are the same.

On Lightning and the Lightning Chain.

From Dr. Franklin's Theory.

WHILE a thunder cloud is swelling and extending its branches over a large tract of country or sea, the lightning is seen to dart from one part to another, and often to illuminate its whole mass. When the cloud has acquired sufficient extent, the lightning strikes between it and the earth in two opposite places. As the lightning continues, the cloud grows thinner, till at length it breaks in different places, and displays a clear sky.

The clouds, however, are sometimes negatively electrified with respect to the earth; and in this case the lightning is supposed to proceed from the earth to the cloud; but the mischievous effects are the same; in fact, there is reason to think that this is a rare case.

Doctor Franklin, who ascertained the identity of lightning and the electric fluid, suggests the means of preserving buildings and vessels from the effects of lightning, by the use of metallic conductors, attached to the outside of buildings, and the royal mast heads of ships. Those used for buildings are iron rods, leading to the ground; those for ships are chains, leading into the water. These are now so common, that it is unnecessary to describe them. The conductor should be pointed at the top, in order the more gradually to attract the electricity from the clouds and atmosphere; and, in order that it may not rust, the upper part, or spear, ought to be of copper. The conducting rod, or chain, ought not to be too slender.

It cannot be doubted that many vessels have been destroyed at

sea by lightning, which have never been heard of. It was the opinion of every person on board the ship William Savery, (then under my command,) that her lightning chain preserved her from damage by lightning, when near Sandalwood Island, in 1820.

The distance of a thunder cloud, and consequently the degree of danger, is not difficult to be estimated. As light travels at the rate of 22,420 leagues in a second of time, its effects may be considered instantaneous, within any moderate distance; but sound, on the contrary, is transmitted at the rate of only 380 yards in a second. Therefore, by accurately observing the time which intervenes between the flash, and the report of the thunder which succeeds it, a very near calculation may be made of its distance.

In a thunder storm, the places of greatest safety are—in a house, the cellar, or in a feather bed, or in the middle of a room, provided there be not a metal chandelier or other conductor;—in a field, at a distance from trees—and on board a ship, at a distance from the masts.

I was on board the brig Edward Hammond, in St. John's, Antigua, in 1786, when she was struck with lightning; which split her main mast and main top masts, and running down by the partners of the mast, tore three planks off the starboard side, abreast of the mainmast. Providentially, however, only one of the crew, who was near the main mast, was injured, and but slightly.

I could recite many more instances of the dangerous effects of lightning, which have come under my notice, since I have followed the profession of a seaman, but the familiarity of this subject to almost all persons, renders it unnecessary. I will only add, that the importance of the lightning chain will be admitted, upon reflection on the dangers against which it guards.

An Improvement on metallic Conductors or Lightning-rods, in a Letter to Dr. David Rittenhouse, *President of the Philosophical Society, from* Robert Patterson, *of Philadelphia.**

"FROM the instances which now and then occur of houses being struck with lightning, that are furnished with metallic conductors, and the frequent instances of these conductors having their tops melted off by a stroke of lightning, it appears that

* This paper was honoured with the Magellanic premium, by an award of the Society, in December 1792.

this admirable contrivance for guarding houses against the dangerous effects of lightning is, in some degree, still imperfect. Some improvement seems yet to be wanting at both extremities of the rod—at the upper extremity, to secure it against the accident of being melted, which renders it afterwards unfit to answer its original intention, viz. drawing off the electric fluid, or lightning, from the passing cloud, in a silent, imperceptible manner; for it is only *pointed* conductors that possess this property—and at the lower extremity, to afford a more ready passage for the fluid into the surrounding earth.

"The first of these intentions would, I am persuaded, be effectually answered, by inserting in the top of the rod a piece of *black lead*, of about two inches long, taken out of a good pencil, and terminating in a fine point, projecting but a very little above the end of its metallic socket; so that, if the black lead point should happen to be broken off by an accident, of which however I think there can be but little danger, still the point of the rod would be left sharp enough to answer the purpose of a metallic conductor.

"This substance is well known to be infusible, by the greatest heat, and hence its use in making crucibles; nor is it evaporable, as remarked by Cronstedt, in his mineralogy, sect. 231, except in a slow calcining heat, to which it could never be exposed on the top of a lightning rod.

"At the same time its power as a conductor of electricity is perhaps equal, or but little inferior, to that of any of the metals. A line drawn on a piece of paper, by a black lead pencil, will, as I have often experienced, conduct an electric explosion seemingly as well as a similar line of gilding would do, and that without ever losing its conducting power, which is not the case with gilding.

"The second intention is, to facilitate the escape of the electric fluid, from the lower part of the rod into the surrounding earth. It is, in many cases, impracticable, from the interruption of rocks or other obstacles, to sink the rod so deep as to reach moist earth, or any other substance which is a tolerably good conductor of electricity. Nor even if this were practicable, would it, I presume, be alone sufficient to answer the desired intention. Iron, buried in the earth, and especially in moist earth, will presently contract a coat of rust, which will continually increase till the whole is converted into rust: but rust of iron, and indeed the calx of all metals, is a *non-conductor*, or at most but a very imperfect conductor, of the electric fluid. Hence it is easy to see, that in a few years after a lightning rod has been erected, that part of it which is under ground will contribute little or nothing towards the safety of the building. Besides, the surface of this part of the rod is *too*

small to afford an easy and copious discharge of the electric fluid into the surrounding earth, when this is but an imperfect conductor.

"As a remedy for these defects, I would propose, that the part of the rod under ground be made of tin, or copper, which are far less liable to corrosion or rust, by lying under ground, than iron. Or, which perhaps would answer the purpose better, let this part of the rod, of whatever metal it be made, be coated over with a thick crust of black lead, previously formed into the consistence of paste, by being pulverized and mixed with melted sulphur, (as in the manufactory of the ordinary kind of black lead pencils) and then applied to the rod while hot. By this means, the lower part of the rod would, I apprehend, retain its conducting powers for ages, without any diminution.

"In order to increase the surface of the lower part of the conductor, let a hole or pit, of sufficient extent, be dug as deep as convenient; and into this pit, let there be put a quantity of *charcoal*, round the lower extremity of the rod. Charcoal possesses two properties which, in a peculiar manner, fit it for answering the purpose here in view. (1) It is a very good conductor, and (2) it will undergo little or no change of property by lying ever so long in the earth. Thus might the surface of that part of the conductor, in contact with the earth, be increased with little trouble or expense to any extent, at pleasure; a circumstance which every one acquainted with electrical experiments must acknowledge to be of great importance to the end here proposed."

On the Wind.

Wind is the motion of a stream or current of air produced by a partial change of temperature in the atmosphere; for, when one part is more heated than the rest, that part becomes rarefied and light, and the equilibrium is consequently destroyed. When this happens, the surrounding air rushes towards that part, in order to restore it: this spot therefore receives wind from every quarter. Those who are to the north of it experience a north wind; those to the south, a south wind, &c.

On the Trade Winds.

This rarefaction of the air mostly takes place in the greatest degree about the equator, the sun's heat being there the greatest; and were the winds from the north and south, thus occasioned, not diverted from meeting at that place, it would exhibit a continual scene of whirlwinds, hurricanes, rain, lightning, thunder, &c.

But fortunately the intervention of another natural power prevents this mischief. The sun, in moving over the equatorial regions from east to west, rarefies the air as it passes, and causes the denser eastern air to flow westwards, in order to restore the equilibrium. With this wind the winds from the north and south combine about the tropics, and form what are called the trade winds :—the combination of the two winds north and east produces a constant northeast wind ; and that of the two winds south and east, produces a regular southeast wind. These winds extend to about 30° on each side of the equator.

The monsoons, or periodical trade winds, change their course every six months. This variation is produced by the earth's annual course round the sun ; the north pole being inclined to the sun one half of the year, the south pole the other half. During the summer of the northern hemisphere, the countries of Arabia, Persia, India and China are much heated, and reflect great quantities of the sun's rays into the atmosphere, which, together with the effect produced on it by the direct rays of the sun, cause in it extreme rarefaction, and consequently destroy its equilibrium. In order to restore which, the air from the equatorial southern regions, where it is colder, (as well as from the colder northern parts,) necessarily have a motion towards those parts. Thus, the current of air from the equatorial regions produces the monsoon for the first six months, in all the seas between the heated continent of Asia and the equator. The other six months, when it is summer in the southern hemisphere, the ocean and countries towards the southern tropic are most heated, and the air over these parts most rarefied : then the air about the equator alters its course, and flows exactly in an opposite direction. This change, however, does not take place suddenly, but by degrees, as the sun crosses the line, or changes its declination : and to the changes which this produces in the direction of the currents of air, are justly ascribed the storms and hurricanes which take place at that season.

The great variety of winds which occur in the temperate zones, are caused by the continued agitation of so large a portion of the atmosphere as is over the torrid zone. These agitations in an elastic fluid, which yields to the slightest impression, must extend every way to a great distance. The air therefore, near, or on land, in particular, will suffer more or less variation and disturbance : and it also is subject to considerable change, according to the situations of countries, the positions of mountains, valleys, and a variety of other causes : hence the cause why almost every climate is subject to variable winds, may be easily conceived.

The seabreeze observable on islands and other seashores, is an effort of the atmosphere to restore its equilibrium, which has

been disturbed by reflections from the heated surface of the land: when night has cooled the land, and condensed the air, it is generally found to flow back to the sea.

In the same way we may account for the decrease of the wind which usually takes place about sunset, on land; because the rarefaction of the air in the particular spot which produces the wind, diminishes as the sun declines, and consequently the velocity of the wind abates.

Electricity, acting on the atmosphere, by which currents of air are always produced, has great influence on the wind and weather. When the atmosphere is expanded by electric fluid, and overcharged with vapour, it is incapable of supporting a great quantity of the latter, which descends in wet fogs or rain, while the denser or heavier air, near the rainy district, rushes towards it to restore the equilibrium. I once experienced the effects of electricity in the air, in the ship William Savery, on a passage from Savannah to Liverpool, in lat. 47° north, between the Banks of Newfoundland and the coast of Europe. For several days the air was so much charged with electric matter, that no person could touch the lightning chain without receiving an electrical shock: and the compasses would frequently flutter and turn round. At the same time the mercury in the barometer stood very low, and we had hard gales, heavy gusts, small rain, flashes of lightning, but no thunder.

Hurricanes

Are seldom experienced beyond or nearer to the equator than 9° or 10° north or south. They rage with the greatest fury near the tropics, in the vicinity of land or islands. Out in the open ocean they rarely happen.

The West India islands, the east coast of Madagascar, and at and near the islands of Mauritius, Bourbon, Rodrigo, and places to the eastward of those islands, within the limits of the southeast trade winds, are subject to hurricanes. They also prevail on the east coast of India, particularly in the Bay of Bengal, at the change of the monsoons.

The hurricane months, in the West Indies, are from July to October; but in September they are most frequent. In and near the islands of Bourbon, Mauritius, Rodrigo, &c. they are December, January, February, March and April; but most frequent and severe in February and March.

I experienced two hurricanes, in Mauritius, in 1806; one in February and one in March.

The Island of Jamaica was visited by a dreadful hurricane in 1780.

Northers

ARE frequent in the Leeward Islands of the West Indies, in October, November, January, February and March, and rage with great fury. I experienced a severe Norther in Jeremy, in the Island of St. Domingo, in the month of October, 1794; nine vessels were driven ashore, and one foundered at her anchors, in the same gale. We, however, had the good fortune safely to ride it out.

Southers

ARE frequent in Jamaica, where they blow with violence in the months of June and July. They also prevail at the Cape de Verde Islands, in July, August, and September.

Tornadoes

ARE experienced on the western coast of Africa: they are so called from their coming up from the leeward, against the regular trade winds. The tornado is first seen to the leeward, as if rising out of the water, and, at first, has the appearance of black land, and thus gives timely notice to take in sail. We experienced one on that coast in 1785, in the ship Commerce, of London, captain James Thompson. On its first appearance we had a fine breeze from the westward, which, where we then were (between Cape Three Points and Cape Coast) was the usual trade wind. All sail was immediately handed, except the fore top mast staysail, which was kept out to veer under. The tornado blows furiously for about twenty or thirty minutes, with thunder, lightning, and torrents of rain.

White Squalls

GENERALLY happen at no great distance from land. They blow with great violence, but are of short duration. They are nevertheless very dangerous, as they happen when the weather is clear, without any appearance in the atmosphere to indicate their approach. The only mark that accompanies them is, the white water on the surface of the sea, which is thrown

up by the force of the wind. I was on board the ship Rambler, a privateer, of Salem, in 1782, near the Island of Cuba, when she was upset by a white squall; but, the ballast being well secured, by letting all the sheets fly, she fortunately righted. These squalls do not happen frequently; very few seamen are therefore acquainted with them. From their appearance on the water, they are sometimes mistaken for the rippling of a current. I was once deceived in this way in the Mediterranean. During the many years I have passed at sea, I have seen but few of them.

Water-Spouts.

IT was formerly thought that the water which composes a water-spout ascends, but it has been since proved to descend. I myself once observed one, to the southward of Bermuda, which passed close to the stern of the vessel. I plainly saw the water descend, contrary to my former opinion.

Water-spouts are supposed to be occasioned by the sudden rarefaction of the lower part of the atmosphere, in a particular spot, at a time when the regions above it are heavily charged with vapour, condensing, or already condensed. It is also supposed that the condensation of these vapours may, from some cause unknown, be quicker in one place than another; and that when this happens above the place, and at the time of this sudden rarefaction below it, it presses most to this particular point, to which it descends through the more rarefied subjacent region; the first drops piercing and making a channel, may facilitate the descent of the vapour, till it puts on the form of a speaking trumpet, with the small end downwards. The agitation caused by its descent, will accelerate condensation, which, together with the drops passing through the vapour in the channel, may at every step in the passage be wasting the vapour, by taking it up into lesser masses of water, till it ends in a point, which it will in this case naturally do, because the swiftest motion down is in the centre of the pointing body.

All obstacles removed, such a spout may increase so as to form masses of water, the substance of the cloud, passing down in greater abundance, and still more swiftly condensing; or it may presently cease, when it has just appeared; or, instead of this, make, as it were, several attempts for completing a spout, the vapour teat advancing and retiring alternately; but finally failing, without producing effect. Thus it has done, it seems, when the cloud has not had sufficient supplies for it to succeed

in a complete and opaque spout. The obliquity of the spout's pointing is owing to the course of the air.

A great roar attends a complete water-spout, while it lasts, occasioned by the fall of the water on the surface of the sea; and is the same as that of cataracts or falls of water from great eminences. This kind of roar could not exist in any way of ascent, being very different from that of a whirlwind, which is no other than that of any other strong wind.

Whirlwinds are frequent, and some of considerable strength; and the opinion is pretty general that water-spouts are sometimes formed by them. When both whirlwinds and water-spouts happen at sea, they are attributed to an electrical cause, which, expanding and rarefying the air, in a small compass, near the surface, causes it to ascend into or through a higher region of the atmosphere, the air in which, being heavier, descends with such velocity that it rebounds from the surface of the sea or earth, carrying with it such moveable substances as come in its way, sometimes in a direct, and sometimes in an oblique direction.

Water-spouts alone are sometimes caused by electricity taking effect near the surface of the earth or sea.

I have frequently heard and read of water-spouts falling on the decks of vessels, but never with sufficient power to break them through. It has, however, descended in heavy torrents, so as almost to drown the crews; and some have been washed overboard, and the upper works of their vessels damaged.

Whirlwinds.

THE ship Orion, of Philadelphia, was struck by a whirlwind, off Cape Finisterre, while under my command. She was under fore top mast staysail, fore sail, main staysail, mizen staysail, and mizen. It blowing heavy in sudden gusts, the ship had but little way, when the whirlwind struck her. It hove the mizen and mizen staysail aback, while the head sails remained full. Its duration was not more than two or three seconds.

The most severe whirlwind I ever heard of was one that struck the ship General Clarkson, of New York, captain Conklin, somewhere in the longitude of Madagascar, bound to Canton. It carried up the main top, with the main trustle trees, off the main mast head, with the main top mast, and two of the men in the main top, broke the main shrouds in different parts, the lanyards of the shrouds, &c. I was in Canton when the ship arrived.

It may be possible that whirlwinds are occasioned by a sudden rarefaction of air in a small compass, occasioned by electricity in the atmosphere; in which case the surrounding air being much heavier, rushes from all sides, into this space of rarefied air, and being in that space still much lighter above than below, will occasion a constant current of air to run up.

It is the opinion of some, that upon this principle the water is drawn up from the sea, which occasions water-spouts; but if this be the case, the water in its asscent must be quite salt.

I was in the brig Revolution, captain Stansberry, from North Carolina bound to Havanna, in the year 1782, when a water-spout passed close by our stern; we received a great part of it on our quarter deck. It appeared like a body of water pouring down from above, and striking upon the surface of the sea, it rebounded to the height of six or eight feet, which occasioned a roaring noise. We all tasted the water which fell, and it was quite fresh. We fired a six pound shot at it and some musket balls, but without affecting it in any degree.

The Velocity of the Wind

MAY be ascertained by different methods, and with tolerable correctness, by observing the motion of detached clouds, when they are passing near the earth; for in such case their velocity will be little less than that of the wind. Those clouds which pass near the surface of the earth are called by mariners scuds: they are much like mist or fog. By measuring the intervals of time between the passage of a cloud over two places, and comparing it with the distance between them, its velocity may be ascertained.

This may also be done at sea, when two ships are at a considerable distance from each other, in the direction of the wind, and are sailing at the same rate, on the same course. When the shadow of a cloud, passing under the sun, is observed to darken the sails, the time may be noted by a watch with a second hand, and when the shadow of the same cloud darkens the sails of the other ship, to leeward, the time ought also to be noted. The distance between the ships may be also measured by sound, if they are at least two miles apart; one of them firing a signal, that the other may note the time from seeing the explosion to hearing the sound; the rate at which sound moves along the surface of the earth being 1130 feet in a second, and

6000* feet being a nautical or sea mile. The interval of time being compared with the velocity of sound, will give the distance between the ships; with which compare the time employed by the shadow of the cloud in passing from one ship to the other, and it will show the velocity of the wind or cloud for that distance.

If two ships are near each other, and the height of their mast heads are known, the angle of one of their mast heads may be measured by a quadrant or sextant, and used as the base of a right-angled triangle, to obtain their distance.

Velocity of the Wind.

Miles in an hour.		Miles in an hour.	
1	hardly perceptible.	30, 35	high wind.
2, 3	just perceptible.	40, 45	very high wind.
4, 5	gentle pleasant breeze.	50	a gale of wind.
10, 15	pleasant fresh breeze.	60	a heavy gale.
20, 25	very brisk.	80	a hurricane.
		100	a hurricane that tears up trees and blows down buildings, &c.

The Origin of Springs and Rivers.

IT is well known, that the heat of the sun draws vast quantities of vapour from the sea; which, being carried by the wind to all parts of the globe, and being converted into rain and dew, falls down upon the earth. Part of it runs down into low places, forming rivulets; part serves for the purpose of vegetation, and the rest descends into hollow caverns within the earth; which breaking out by the sides of hills, form little springs. Many of these springs, running into valleys, increase the brooks or rivulets; and several of these make a river. Small rivers are thus formed; and these again, being joined by other small rivers, and united in one common channel, form large streams, such as the river Mississippi.

Some springs yield always the same quantity of water. Some naturalists, therefore, have recourse to the sea, and derive the

* Mr. Richard Norwood, in his Seaman's Practice, says that a degree on the earth contains 367,200 English feet; which will make 6120 feet a nautical or sea mile. But he at length consents to allow a degree to consist of 360,000 feet, and consequently 6000 feet (being one sixtieth part of that sum) to be one sea mile. I adopt the latter, because it is from about that estimate that the knots of the log-line are deduced. Some make a nautical mile 6080.

origin of several springs immediately from thence, by supposing a subterraneous circulation of waters from the fountains of the deep.

The Cause of Earthquakes.

EARTHQUAKES are generally supposed to be caused by nitrous and sulphurous vapours, enclosed in the bowels of the earth; which, by some accident, take fire, where there is little or no vent. These vapours may take fire by fermentation,* or by the accidental falling of rocks and stones in hollow parts of the earth, and striking against each other. When the matter which forms subterraneous fires ferment, heat, and inflame, the fire makes an effort on every side, and if it does not find a natural vent, it raises the earth, and forms a passage, by throwing it up, producing a volcano. If the quantity of substances which take fire be not considerable, an earthquake may ensue without a volcano being formed. The air produced and rarefied by the subterraneous fire, may also find small vents, by which it may escape; and, in this case, there will only be a shock, without an eruption or volcano. All inflammable substances capable of explosion, produce by inflammation a great quantity of air and vapour, and such air will necessarily be in a state of very great rarefaction. When it is compressed in a small space, like that of a cavern, it will not shake the earth immediately above, but will search for a passage, in order to make its escape, and will proceed through the several interstices between the different strata, or through any channel or cavern which may afford it a passage. This subterraneous air or vapour will produce in its passage a noise and motion proportionable to its force and the resistance it meets with. These effects will continue till it finds a vent, perhaps in the sea, or till it has diminished its force by expansion.

Mr. Whitehurst imagines that fire and water are the principal agents employed in these dreadful operations of nature.

* Monsieur Lemery, having covered up in the earth about fifty pounds of a mixture composed of equal parts of sulphur and filings of iron, tempered with water, worked into a paste, after eight or nine hours' time, the earth where it was laid, vomited up flames, and caused the earth round it to tremble. From this experiment we see the true cause of the fires of Ætna, Vesuvius, and other burning mountains of sulphur.

SAILING DIRECTIONS

FOR THE

MADEIRAS, CANARIES AND CAPE VERD ISLANDS:

AND FOR

CROSSING THE EQUATOR IN THE ATLANTIC OCEAN.

Directions for the Brazil coast, the Gulf of Guinea, with the Latitudes and Longitudes of the Head Lands, and principal Harbours, as well as Rocks, Shoals and Islands lying in the route to them, from the Equator; with the Winds and Currents at the above places. Drawn from the Observations of Officers of several British East India Company ships. Also particular Instructions for navigating the river Plate. By Captain Haywood.

With some Remarks and Observations of the Author, as well as several other Masters of American ships.

AFTER leaving the English Channel, steer to pass to the westward of Madeira at any convenient distance exceeding 7 or 8 leagues. In winter months it is preferable to pass to the west of Madeira, for strong gales from the westward prevail in November, December, and January, producing eddy winds, and severe squalls near the land; which are occasioned by the high land obstructing the regular course of these gales. In November 1797, and December 1799,* I was each time forced to put to sea from Funchal Road. Severe westerly and S. W. gales, with hard squalls and rain, kept us at sea eight days each time, and prevented us from anchoring afterward, the S. W. wind continuing to blow strong. In these gales, the island of Madeira and the Desertas, were frequently obscured in fog; and the squalls so sudden and violent near the latter, and about the south-east end of the former, as nearly to overset one of the ships in company.†

* The principal part of these sailing directions is copied from James Horsburgh's directory, formerly commanding the ship Anna of Calcutta.

Wherever *I* or *we* is expressed in the sailing directions, it alludes to Captain Horsburgh. Where an American vessel is mentioned, it is the author's own remark.

† November 28, 1797, blowing hard at S. W. off the S. W. end of Madeira, and a high sea rising, we bore away in the Carron, to endeavour to find shelter under the lee of the island. In running between Madeira and the Desertas, blowing very hard at S. W. with dark weather and rain, we were sud-

PORTO SANTO, in lat. 33° 5′ N. long. 16° 16′ W., is a high island with several peaked hills on it, about 12 or 14 leagues north eastward from the east end of Madeira, and generally seen by ships bound to the latter: it has a bay on the southwest side, where there is anchorage, water and refreshments; and this road has a rock at its west end, like that of Funchal. Although Porto Santo is not so high as Madeira, it may be seen 12 or 14 leagues from a ship's deck; and is easily distinguished from Madeira or the Desertas, by its Peaks and uneven appearance; these islands having a more regular outline.

The Reef said to lie 3 leagues to the northeast of Porto Santo, on which a Dutch ship was lost, has been found by H. M. S. Falcon to bear about N. 18° W. true bearing, from the body of the island, distant from the nearest part about 7 miles.

The Falcon, Lieutenant J. Bowen, examined this reef, or rocky bank, on the 10th of January, 1802. When the easternmost rock, off the N. E. point of Porto Santo, bore by compass S. E. the N. E. point of Porto Santo S. S. E. ½ E, northernmost rock S. ½ W., and the west point of Porto Santo S. S. W. ¾ W. had 22, 23, and 25 fathoms rocky bottom; the master in the cutter, at the same time, about ¾ of a mile S. ½ W. from the ship, had 30 fathoms rocky bottom; from whence rowing to the westward the depth gradually decreased to 16 fathoms, and then more suddenly to 12, 8, and 4½ fathoms on the shoalest part of the rock, which was plainly discerned from the boat. When she was on it in 4½ fathoms, the northeast point of Porto Santo bore by compass S. S E., the northernmost islet or rock S. by W., and the west point of the island S. S. W., distant from the nearest part of it about 7 miles.

This rocky bank extends east and west about 1 mile, terminating in a point of rocks to the westward, on which the least water appeared to be 4½ fathoms. Lieutenant Bowen remarks, that when the bearings were taken upon it in the boat, the compass was agitated by her motion, and therefore may not be perfectly correct, but he is certain that the boat was on the shoalest part, otherwise the sea must have broke on it, had there been less water, by the considerable swell and fresh breeze which prevailed

denly becalmed; then followed an eddy wind from N. E., the sea so high as frequently to cover the bowsprit and jib-boom. At this time we were much nearer to Madeira than to the Desertas, with a dark cloud extending over us. At the same time, two ships about two or three miles more eastward, were in clear sunshine, running before a severe squall at S. W.; and one of them had her main topsail blown away. In December 1799, by carrying a press of sail on the Anna, we just cleared the southernmost Deserta, in very thick weather, during one of these westerly storms, which drove us 2 degrees eastward from Funchal. Several outward bound West India ships, were lately dashed in pieces, by running on the Desertas in the night; the effect of an error in their dead reckoning.

at the time. Coming on to blow, he was prevented from making further observations.

With the wind from the northward or N. E., bound to Funchal, the channel between Madeira and the Desertas is the most convenient, and seems about 4 leagues wide from the east point of Madeira to the Flat or Table Deserta, which bounds it to the eastward.

DESERTAS, are high barren rocks, except the northwesternmost, which is level and much lower than the others. The middle Deserta is the largest, between which and the southernmost, called Bogia, there is a narrow channel, never to be attempted unless from necessity, as a ship is liable to be becalmed in it by the northern Deserta, which over-laps the Bogia. The fleet under convoy of H. M. S. Lavinia, bound to India, and to touch at Funchal, passed through the channel between the Middle and South Desertas, in May 1809. They mistook the Desertas for Madeira, and after steering for the south extreme of the large or middle Deserta, proceeded through the channel between it and the southern island, which is 1 or 1½ mile wide at most, and seems perfectly clear of danger. None of the ships tried for soundings, but the fishermen say, that bottom may be got with 60 to 300 fathoms of line, according to the distance from either shore.

The Desertas stretch nearly N. N. W. and S. S. E., rather of an even appearance, and are about 5 leagues in extent. At the N. W. end of the great Deserta, is situated the low small N. W. Deserta, which bounds the channel between these islands and the east point of Madeira. This small level island is seen at 5 or six leagues distance, just appearing above the water, and close to it there is a pyramidal rock, which may sometimes be mistaken for a ship under sail.

MADEIRA is very high and generally clouded, except in serene weather; the east point, which is in latitude about 32° 42′ N. projects out in a kind of peninsula, rather low and rugged, forming an indentation or bay to the southward. In this bay there are soundings laid down in some charts, but they must be very near the shore. In summer, when the N. E. winds prevail, a S. W. current sets through the channel between Madeira and the Desertas: and in that season, when the weather is settled, off Funchal valley there are regular land and sea breezes; the sea breeze setting in from S. westward in the forenoon, and the land-breeze comes from the shore generally about 10 o'clock at night, but sometimes not till two or three o'clock in the morning. These land breezes do not extend above three or four miles off shore. It has been said, that southerly winds never blow hard quite to the shore at Funchal, that the south-

westers or southeasters are never expected, except in January, February, and the beginning of March, and that large ships almost always ride them out; whereas, it is certain, these southerly gales blow quite home to Funchal, sometimes in November and December; and when they are apprehended, it is common for ships of every description to put to sea. These S. W. or S. E. gales, are in general preceded by a swell tumbling into the road, often accompanied by gloomy weather, drizzling rain, and a very unsettled breeze from the land, veering several points backward and forward very suddenly. By such indications ships generally proceed to sea; for should it blow from southward, it would be almost impossible to clear the shore on either tack after cutting or slipping, the anchorage being near the land. Some ships have rode out these southerly gales, but others have been driven ashore.*

In passing through the channel between Madeira and the Desertas, a ship ought to keep at a considerable distance from both; for it would be unpleasant to be drifted near either in calm weather, on account of the want of anchorage. In November, 1797, the Anna drifted in a calm very near the shore to the northward of the Brazen Head, and brought up with the stream anchor in 60 fathoms water, her stern not far from the rocky cliffs. After being at anchor some time, a light breeze from the land, with the help of the boats towing, enabled her to get out of this precarious situation. When a ship has advanced through the channel, and approaching the Brazen Head, she should not keep near it, in case of being becalmed, as there is no anchorage near to this steep bluff point, which is the eastern extreme of Funchal road.

Near this bluff head land, ships are frequently baffled by eddy winds and calms, and obliged to get their boats out to tow: it is therefore adviseable not to borrow too close to it in passing, nor to haul in for the road till nearly abreast of the town. Should a ship enter the road by night, it is proper to show a light at her ensign staff, to prevent being fired at from the forts. In working in with a land breeze, it is best to make short tacks opposite the valley, for here both the land and sea breezes prevail. The Loo rock, situated near the shore, at the west end of the town, is a high rock with a fort on it; and the citadel is a brown square fort on a hill, over the W. N. W. part of the town. The best birth for large ships is the Citadel, a little open to the eastward of the Loo rock, in 30 or 35 fathoms water; the distance from the Loo rock will then not exceed a large half mile.

* A few years ago, several ships at anchor in Funchal road, were driven on shore, and wrecked by one of these gales. This, I think, happened in April or May. The S. W. gales are more frequent at Funchal than any other strong winds.

With the Loo rock and citadel in one, bearing about N. N. E. ¼ E. Funchal steeple N. E. ¼ N. by compass, the anchorage appears equally good, in 35 fathoms, stiff ground. With the Loo and Citadel in one, the ground is also good in 45 fathoms, off the former about one mile. Further to the westward the ground is not so good, and to the eastward the bank has a sudden declivity from 50 or 55 fathoms good ground, to 100 fathoms rock, and then no ground. If southwesters are expected, which are frequent in winter, to anchor with the Loo and Citadel in one, or the latter just open to the westward of the Loo, is the most convenient birth to put to sea from, or to ride out a S. W. gale. But the Citadel well open to the eastward of the Loo, is the best anchorage when southeasters are expected. In coming into Funchal road with a brisk wind, sail should be reduced in time, to prevent having too much way through the water, at the time of anchoring; and a ship should be brought up with her head to seaward, that in case any accident prevent her bringing up, sail can be made off shore, or otherwise as most expedient. It is best to ride with a whole cable, when there is the least appearance of unsettled weather, with a slip buoy on the cable, in case of being obliged to cut near the end or splice, and put to sea quickly; as there would not be time to weigh the anchor, from the sudden approach of blowing weather.

In light breezes and calms, it is proper to have a kedge anchor out to steady the ship, and prevent fouling the bower.

The beach is composed of shingle, and has generally a surf on it, which prevents a ship's boat from landing abreast of the town; but on the northwest side of the Loo rock, about half a mile from the town, is the only place to land from a ship's boat; the country boats are employed in watering. The current along the south side of Madeira and the Desertas, mostly sets to leeward in strong gales; but at the conclusion of a gale it sometimes changes suddenly, and sets contrary to the wind. The tides rise and fall about seven feet, at full and change. The rainy season is said to be January, February, and March; October is also frequently a wet month. And when hard westerly gales blow in November, or more particularly in December, they bring with them cloudy weather and rain. There is a perpendicular high cliff of majestic appearance, about three and a half leagues westward from Funchal, called Point de Sol, with a small bay to the eastward of it, said to have anchorage in it near the shore. In westerly gales and stormy weather, Point de Sol, (Point of the Sun) is often painted with beautiful portions of rainbows, which give it a grand appearance.

There have been a few instances of hurricanes blowing down through the valley of Funchal: somewhere about 1803 or 1804, a condensed cloud poured a torrent of water on the mountain

at the head of the valley, which deluged many vineyards in its passage, and washed away some of the houses in Funchal.*

Funchal is in lat. 32° 37′ 30″ N. lon. 16° 55′ W. by the French astronomers. The celebrated Captain Flinders, and Mr. Crosley the astronomer, made it in long. 16° 56′ W. The observations and chronometers of Captains C. C. M'Intosh, Heywood, and Captain Millikin Craig, three navigators of great ability, make Funchal in long. 16° 50′ W. 16° 51′ W. and 16° 52′ W.; the latter is probably nearest the truth, being nearly the mean of the whole. In the road, about ¾ of a mile off the Loo Rock, the observed latitude I made 32° 36′ 33″ N. Variation 21° W. in 1811.

At leaving Funchal, ships should steer directly from the shore, to prevent being baffled by calms or eddy winds under Point de Sol, or the Brazen Head, for vessels are liable to calms under the high land to the westward.

The best route to Madeira, from the United States, is in high latitudes till you make the western islands, and steer over for that island, rather for the east end. Both Porto Santo and Madeira being high it cannot be easily missed; for if you get into the latitude of Madeira while you are to the westward of it, you are liable to have long passages; as in that latitude the wind blows from the eastward eight months in the year, particularly when drawing near the meridian of Madeira. When I was a boy on board of a ship from Philadelphia, by getting into the latitude of Madeira while to the westward of it we had above sixty days passage, whereas if the captain had run first for the Western Islands as above, in all probability we should not have had more than twenty days.†

DIRECTIONS FOR SAILING FROM MADEIRA TO THE SOUTHWARD:

Salvages, Canary and Cape Verd Islands.

Departing from Madeira, or after passing it to the westward, the track most adviseable is to the westward of the Canary and Cape Verd Islands, at any discretional distance, or barely in sight of them. By adopting this route, steadier winds may be expected, than by passing close to, or among these islands. The Britannia, outward bound in November 1803, had W. S. W. and S. W. winds, and was several days close to the coast of

* The small pox is much dreaded at Madeira. Were a ship discovered to have this distemper on board, she would be ordered to leave the port

† When in Madeira, in 1815, in the ship Recovery, of Philadelphia, I was informed by several intelligent inhabitants of that place, that this supposed "condensed cloud," turned out to be a large gulley, at the head of the valley, containing many hundred tons of water, the borders of which, having been bursted by heavy rains, the water descended in torrents, and occasioned the devastation.

Africa, in latitude 29° N. In January 1795, the Swallow, after passing in sight of the Canary Islands to the westward, had the winds from that quarter, which obliged her to pass to the eastward of the Cape de Verd Islands; it therefore seems preferable, to keep to the westward of all the islands, which is the track now generally adopted.

If a ship be bound to Teneriffe, or intend to pass between the Canaries, or is laid off to the S. S. Eastward after passing Madeira, care is requisite to avoid the Salvages, which must not be approached in the night.

Captain James Mortlock, an excellent observer and astronomer, passed within 1½ mile of the southern Salvages, in the Young William, and made a plan of them; these consist of two islets, with several rocks about them, from which the Great Salvage lies 3 or 4 leagues N. Eastward, being a single high rock that may be seen 8 or 9 leagues. No dangers were discernible between the Great Salvage and the Piton Group. He made the Piton or southernmost islet, in lat. 30° 8' N. long. 15° 42' W.; and the Great Salvage in lat. 30° 14' N. The longitude from these islets, was measured to Ferro by chronometers, in a run of 24 hours, and rests on Ferro, being in 17° 58' W., as the chronometer measured 2° 16' W. from the Piton or southern Salvage to Ferro.

The Great or north Salvage, by mean of the observations of different navigators, is in lat. 30° 13' N. long. 15° 46' W., and the Piton or south Islet in lat. 30° 5' N. long. 15° 50'. W.

The CANARY ISLANDS, are eleven in number, (four of them small,) extending from lat. 27° 40' to 29° 20' N. and from long. 13° 35' to 18° 6' W. They are mostly high, with steep rocky shores, rendering the landing often impracticable, and they are all destitute of safe harbours for large ships.

PALMA, the northwesternmost of these islands, is 8 leagues long and 6 leagues broad, and is frequently seen by the outward bound East India ships. It is high, with a bold coast, by which some navigators run towards it with great confidence in the night; but several ships have been nearly lost on this island in dark nights, the lights on the impending mountains first showing their situation. Captain L. Wilson, a scientific observer, places Palma, the north point, in lat. 28° 51' 20" N. lon. 17° 48' 40" W., the west point in lat. 28° 46' N., lon. 18° 4' 30" W., and the south point in lat. 28° 32' N. lon. 17° 54' 45" W. This island is said to be more subject to the westerly winds and rains than any of the others. Santa Cruz, the chief place, is near the middle of the east side.

The channels among the Canary Islands are clear of dangers, except a sunken rock laid down in some charts in lat. 27° 52' N., in the channel between Canary and Teneriffe, about 7 leagues

from the latter, and 5 leagues west from the former. It seems uncertain if this danger really exists, though it may be proper to avoid its assigned position. Many of the outward bound ships pass between Palma and Gomera, when laid off to the eastward by westerly winds, or otherwise.

Santa Cruz, in the island of Teneriffe, is in lat. 28° 29′ N. lon. 16° 22′ W. being the port generally used by ships which stop at these islands to procure refreshments. It is on the east side of the island, and the road, though indifferent, is one of the best in the Canaries. Ships going in, should not bring any part of the town to the northward of west, for fear of being becalmed by the high land under the Peak, and drifted on the rocky shore, where no bottom is found close to it, with 200 fathoms line.

Merchant ships and small vessels anchor to the N. Eastward of the pier, off the town, in 18 and 20 fathoms, distant from the shore half a mile. Ships of war anchor off the northernmost fort, about half a mile distant from it, with their outer anchor in 36 fathoms, and the inner one in 15 or 18 fathoms. The Hindostan, in October, 1792, at anchor in 28 fathoms dark mud, had the southernmost steeple west, the northernmost fort north, and the easternmost point E. ½ N. The bottom being foul in many parts of the road, it is customary to buoy the cables from the ground. Vegetables are plentiful, also the fruits common in Europe, and good water is easily procured when the surf is not great on the beach. This road is exposed to easterly winds, but these seldom blow hard, although it has sometimes happened, that ships have been driven from their anchors, on shore. Santa Cruz is an excellent place for procuring a supply of cheap wines, which are of a weak quality. The Peak of Teneriffe is in lat. 28° 18′ N. by Captain Cook; and in 28° 15′ 38″ N. by the Requisite Tables. It may be seen about 45 leagues when the atmosphere is clear, being about 12,300 feet elevated above the level of the sea.—Variation 19° W. in 1800.

Oratava, on the N. W. side of the island, has a very indifferent road, where ships stop sometimes to take in wine: the anchorage is in 50 fathoms about 1½ mile off shore, with the Peak bearing S. W. and a pilot should be kept on board. Straggling rocks project two or three ships' lengths from the shore, on which the sea breaks furiously: this road is very dangerous in the winter months, from September to May.

Grand Canary, 12 leagues S. E. of Teneriffe, is nearly round, being about 11 or 12 leagues in extent; it is the best watered, and most fertile of the islands. Palmas, the chief town, is on the N. E. side of the island; its road is sheltered from N. Eastward by that point of the land stretching out in a peninsula, and having some rocks adjoining.

Gomera, distant about 5 leagues to the S. W. from the coast of Teneriffe, is 6 leagues long, and its medium breadth 3 leagues. Palmas, the chief place, is in a bay on the east side, sheltered from the northward by a projecting point.

Ferro, the southwesternmost of the Canary Islands, distant 10 or 11 leagues to the southwest of Gomera, is 6 leagues long and 3 leagues broad. El Golfo, on the east side, is the chief village. These islands are destitute of harbours.

Fortaventura, is about 20 leagues long, and from 2 to 5 leagues broad, the south end of it being about 10 leagues to the east of Grand Canary.

Lanzarote or Lancerota, about 6 leagues long and 4 leagues broad, lies to the N. E. of Fortaventura, being separated from it by the Bocayno channel, in which is the island Lobos, 2 leagues long and half a league broad, dividing the channel into two passages. That between Lobos and Fortaventura, is 2 miles wide with 5 fathoms water, and good anchorage. The channel next Lanzarote, is 4 miles wide, with 10 fathoms water. Off the north end of Lobos there is a large reef.

On the S. E. side of Lanzarote, are two ports within reefs, called Puerto de Naos and Puerta Cavallos : the former is the northern one, sheltered from the N. E. by the reefs, and here vessels may refit. It has two entrances between the reefs, with only 14 feet at high water in the northern, and 17 feet in the southern entrance ; the depth within, is 27 to 10 feet, rise of tide 10 feet.

Puerto Cavallos, 1 mile south of the former, has only 12 feet in the channel, and within, 17 feet.

Gratiosa, is 1 league north of Lanzarote, being 5 miles long and 1 mile broad, and the channel between them, forms the harbour of El Rio, in which the depth is 6 and 7 fathoms.

Santa Clara, 6 miles N. W. of Gratiosa, and Alegranza, are small rocky isles destitute of fresh water.

The channel between Cape Juby on the African coast and these islands, is about 20 leagues wide, and clear of danger.

Cape Verd Islands, consisting of ten principal and some small isles, extend from lat. 14° 43′ to 17° 13′ N. and from lon. 22° 28′ to 25° 27′ W. ; they are mostly high land, and some of them afford bays, with anchorage tolerably sheltered.

Outward bound ships for India or St. Helena, do not frequent the channel between Cape Verd and the islands, so often as formerly. Those which do, generally keep in longitude between 19° and 20° W. in passing the islands, to avoid some dangers supposed to lie to the eastward of them, not well ascertained : others keep nearer to the continent, the channel being clear on that side. Were it not for the great haze contiguous to the coast, occasioned by the dust and dry vapour, driven to seaward by

the N. E. winds from the hot sandy desert, the passage near the main would be preferable to that outside the Cape de Verd Islands, when the sun is far to the southward, for steady northerly winds then prevail near the continent, and the route is much shorter than that to the westward;* but the obscure atmosphere, generally renders the inner passage unpleasant when observations are not regularly obtained. The outward bound East India ships, frequented this passage about 40 and 50 years ago, and mostly steered along the coast adjacent to Cape Verd, keeping in regular soundings near the shore, with the lead going in the night, and under easy sail.

In some charts, a reef is placed projecting from Cape Verd to a small distance, but the Cape seems safe to approach, the soundings decreasing regularly to 8 or 10 fathoms off it. The Porgas Bank, placed in some charts about mid-channel between Cape Verd and the islands, probably has no existence, as many ships have passed over the position assigned to it without getting soundings.

The danger most avoided by ships in passing through this channel, is the Bonetta Shoal and Rocks, but it is difficult to assign any position to this danger; by some it is said to lie 22 leagues eastward of the channel, between Isle Sal and Bonavista. Mr. Norris, in a plan of this danger, makes its extent 3½ miles S. W. by S. and N. E. by N. the greatest breadth about 1½ mile, having 35 fathoms 2½ miles to the southward, and at 1½ mile distant from it 20 fathoms, coral; but he places it 42 leagues E. by N. from the north end of Bonavista. It is remarkable that this danger is so little known; I have seen journals of ships which kept nearly in lon. 21½° W. in passing through the channel, and saw no danger.

There is said to be a reef of rocks 6 leagues from Bonavista, about a cable's length in breadth, and two in length. Another account says, this danger is 10 leagues N. E. from Bonavista, and is even with the water's edge. As many ships in running for Bonavista or the Isle Sal, first get sight of these islands bearing S. W. or W. it is strange the danger just mentioned is never seen by any of them, and gives reason to doubt its existence.

St. Anthony, in lat. 17° 2′ N., lon. 25° 25′ W.† and the northwesternmost of the Cape Verd Islands, is often seen by ships passing to the westward of them; and prior to the use of chronometers and lunar observations, it was desirable to see this island, Palma, or Madeira, in order to correct the reckoning. Although this is now not requisite, if a ship have good instruments on board, St. Anthony may, notwithstanding, be passed

* For ships from Europe.

† The Russian Circumnavigator, Captain Krusenstern, made the S. W. point in lon. 25° 24′ W. Captain Lisiansky made it in lon. 25° 23′ W; I made the summit of the island by noon observation and chronometers as stated above.

in sight, without fear of any delay by calms or light winds, if not approached too close. By admeasurement I made the summit of St. Anthony 7400 feet above the surface of the sea, it may therefore be seen near 30 leagues distance from a ship's deck in clear weather, which is seldom the case, hazy or cloudy weather mostly prevailing about these islands.

The channel between St. Anthony and St. Vincent is very safe; the Lord Eldon passed through it in July, 1802, and thought it near 5 leagues broad. In the Young William, Captain Mortlock came through the same channel, and measured 36 miles east from St. Anthony to Brava, by chronometer. In the charts, Brava is in general placed from 15 to 20 miles east from St. Anthony. There is reason to think, the relative positions of Brava, Fuego, &c. in longitude from St. Anthony, are *greater* than marked on the charts.

If an outward bound ship is to stop at Porto Praya, in the island St. Jago, which is frequented by ships in want of water, it will be prudent to steer for the Island Sal, or Bonavista; and to avoid the danger to the westward, and southwest of the latter, she may pass on the east side of these islands; or on the west side of Sal, if the wind is far from the northward, then well to the westward of the shoals, and afterward for Isle May, passing also to the westward of it, she will easily reach Porto Praya Road. If the wind incline from the eastward, to pass to windward of them will be most convenient for reaching Porto Praya with speed. In running for these islands it is proper to look out in time, the current generally setting to the southward amongst them, sometimes strong.

Sal, is high and bold, with two peaks on it, and may be seen 14 or 15 leagues in clear weather. The easternmost peak is highest, and the land between them being low, they appear like two separate islands when first seen: on its west side is Mordeira Bay, one of the best among the Cape Verd Islands; the latitude of the body of this island, is about 16° 45′ N., the northwest point about 16° 50′ N., and the longitude 22° 55′ W., or 35 miles east of Porto Praya, by chronometers.

Bonavista, is very uneven, composed of alternate hills and vallies, and in some places low points project into the sea; the southeast extreme of this island, in particular, is a low projecting point, not discernible until near it. From the low point, a reef of rocks and foul ground extends nearly a league to seaward: on this reef, the outward bound East India ship Hartwell, was wrecked about 26 years back, her cargo and most of the treasure lost. The Resolution, Captain Cook, in her voyage to the South Sea, was nearly sharing the same fate in the night, owing to a southerly current. The east side of this island, has a reef extending all along it, to a considerable distance.

The N. W. end of Bonavista is in about 16° 14′ N. lat. and in lon. 22° 52′ W. and the S. E. end in lon. 22° 32′ W., or 5° 41′ W. from Funchal by chronometer. This island and Sal bear nearly north and south of each other, the channel between them being 7 or eight leagues wide.

MAY ISLAND bears from Bonavista nearly S. S. W. distant 14 or 15 leagues: a reef of rocks projects from the north end of Isle May, to about 2½ miles distance. This island is pretty high at the centre, uneven, and hummocky, and has anchorage under the S. W. end in 7 or 8 fathoms, in a kind of bay called English Road. The shore to the eastward, and abreast the town of May is steep, bluff, and rocky; but to the westward, a low white sandy beach extends to a rounding point, from which a spit of sand and coral stretches out a few cables' lengths, at a small distance from which there is no ground at 40 and 50 fathoms. This spit may be rounded in 17 to 15 fathoms, and a ship should not anchor in the road farther out than 16 or 17 fathoms, as these depths are on the edge of the bank. His majesty's ship Polyphemus, at anchor in 16½, fathoms, had the west point of the bay bearing N. 10° W., the town East, and the south point of the bay S. 59° E., off shore 1 mile. From this anchorage, the chronometer measured 17½ miles west to the anchorage of Porto Praya, and 39 miles east to the east end of Bonavista. The north point of the island is in lat. about 15° 20′ N. and 23 miles east of Porto Praya, by chronometers. All the other Cape Verd islands are high, and most of them have places under the south or southwest sides, where vessels may anchor.*

LETON ROCK or Reef, is very dangerous, and much in the way of ships that pass to the westward of Bonavista. There seems to be another reef considerably to the northward of the Leton Rock, and much nearer to Bonavista. These dangers render the channel to the westward of Bonavista unsafe in thick weather, or in the night; for it is thought the sea does not break on these reefs with smooth water, but when there is much swell, breakers roll over them.

The London, in June, 1795, saw the northernmost breakers: after passing to the westward of Sal, she saw Bonavista bearing S. E. by S. 7 or eight leagues; from hence she steered by compass S. ½ W. 6½ miles, S. by E. 5½ miles, S. by W. 6½ miles,

* On the south side of St. Nicholas, there appears to be several anchoring places. Captain Davis watered there 7th of May, 1779, when pilot of a Dutch ship bound to India. He sailed from thence the 9th, and fell in with the coast of Brazil in lat. 7 degrees S. on the 9th of June; not being able to beat round Cape St. Augustine, he bore away for Fernando Noronha, anchored there in 18 fathoms water, on the north side of the island, the 15th, where he remained until the 26th of August, having procured good water, provision, and refreshments of various kinds.

being then 4 P M. saw from the deck breakers, bearing from S. S. E. ½ E. to S. E. distant 6 or 7 miles; steered S. by W. ½ W. 6½ miles to 5 P. M. the breakers then distant 3½ miles to the eastward.

The Diana, in October, 1805, passed near the Leton or Southern Reef. At 1 P. M. October 21, Bonavista E. S. E. 7 or 8 leagues, steered S. by W. 6 miles, S. by W. ½ W. 12 miles, being 4 P. M., breakers first seen at 3 P. M. now bore E. S. E. 4 miles.

By the relative positions of these ships from Bonavista, and their courses steered till near the breakers, it would seem that the danger seen in the Diana is about 4 leagues to the southward, and considerably to the westward of that seen in the London, if these ships were not differently acted on, by currents or otherwise.

The danger of running into the vicinity of these reefs in the night, has been fatally experienced by the loss of the Lady Burgess, one of the outward bound India fleet, which ship struck among the breakers on Leton Rock, at 2 A. M. 19th of April, 1806. The Alexander, Sovereign, Lord Nelson, and other ships of the fleet, narrowly escaped, after the breakers were perceived close on board. The Lord Melville struck three times, and slipped off the rocks into 25 fathoms, at the time the Lady Burgess was observed standing directly among the breakers. It appears from the journals of the fleet, combined with information received from several of the commanders, that the Leton Rock, or Reef, is composed of coral, no part of it above water. Captain Swinton, late commander of the Lady Burgess, thinks that the extent on which a ship would strike is not above a cable's length, and that there are no breakers on it in fine weather. To the northward, it is steep to, but this danger seems to be the northern limit of an extensive bank of coral soundings, which extends a great way to the southward, and a considerable distance to the eastward and westward. The Asia had 52 fathoms coral at daylight, when the breakers and wreck of the Lady Burgess bore E. by N. distant about six miles, and other ships had soundings from 25 to 50 fathoms to the W. and S. W. of the reef, at 2 to 5 or 6 miles distance. Directly after striking, the Lord Melville had 25 fathoms, with her head to the eastward, and shortly after 30 fathoms; she hove to, with her head easterly until day-light, and had from 30 to 40 fathoms all coral soundings. Some of the other sh ps carried soundings on the Leton bank for 10 or 12 leagues to the southward of the rock, generally coral, sometimes intermixed with sand and shells, and never had less than 20 fathoms; probably, therefore, this coral bank is not dangerous, except on the rock at the northern extremity, already described. By mean of the observations and

chronometers of the fleet, the Leton rock is in lat. 15° 49′ N. lon. 23° 14′ W., and seems to be situated directly north from the Island May, being more to the northward and westward than placed in most charts. Its true relative position from any of the islands, is not, however, ascertained, for no land could be discerned from any of the ships when near the rock, on the morning after the loss of the Lady Burgess, taking her crew from the wreck. Captain Cook, bound to the South Sea on discovery, had soundings 60 fathoms, the Island May bearing S. S. E. 5 leagues; these soundings were probably on the southern extremity of the Leton Bank, as he had previously seen the breakers on the rock, after passing Bonavista on the east and southeast sides.

In running for Isle May in the night, the north part of it must not be approached too close, on account of the reef already mentioned off its northern extremity. This island should also be passed on the east side, if the wind hang from eastward, and when round the south point, a ship should steer westward for the southeast end of St. Jago, with the wind at E. or E. northeastward; but with the wind inclining from northward or N. N. W. the Island May ought to be passed on the western side, then a direct course followed for the southeast point of St. Jago.

This point appears low, when seen either from northward or southward, and projects a considerable way into the sea. To the S. W. about 7 miles from it, is Porto Praya Bay, the principal port in the island St. Jago. Between the east point of Praya Bay and the southeast point of the island, but nearer the latter, a bay resembling that of Porto Praya is situated, which has several cocoa-nut trees, and houses at the bottom of it. Several vessels have mistaken this dangerous bay for the other, and were in danger thereby. From hence to the east point of Praya Bay, the shore is mostly perpendicular.

Porto Praya Fort, situated on a small cliff, is a mark by which that bay may be distinguished from the false one; but the most certain mark is, that the north or east point of the latter is surrounded with breakers, whereas the east point of Praya Bay is high, steep, and free from danger. In running for this place with a brisk northeast wind, a ship should have a reef or two in her topsails when she approaches the east point of the bay, and this point may be passed within the distance of a cable's length, in 8 or 9 fathoms; the same distance from the eastern side of the bay, in 7 or 8 fathoms, is proper in sailing to the anchorage. The eastern shore of the bay is high, and all the land seems parched and barren.

Porto Praya is a fine bay, the two points which form it, bearing from each other about W. by S., and E. by N. 1½ or 1¾ mile distant; and it is of equal depth. After passing the east point,

the fort at the bottom of the bay soon opens, to the westward of which, in a valley, are several cocoa-nut trees, and a small house. A small black island, flat at the top, called the Isle of Quails, is situated on the west side of the bay, having a rocky projection from its south end about half a cable's length; there is also a rocky ledge off the north end, where the water is in general shoal, for 3 fathoms is the greatest depth between this isle and the fort. Between it and the shore, the channel is only navigable for boats. From the west point of the bay, some rocks extend to seaward, and it requires care to avoid them, in sailing from the anchorage in the night.

The best anchorage is, to bring the fort N. W. ½ N. by compass, about 1 mile, the east part of Isle Quails W. by S. or W. by S. ½ S. 1¼ mile, in 7 or 8 fathoms; but nearer to the N. E. side of the bay, is more convenient to weigh from in light winds, or otherwise, to prevent being carried near the point of rocks to leeward by the currents, before a ship has good way through the water. The Earl Talbot, in 7½ fathoms, black sand, had the flag-staff on the hill N. W. by N., Jubaroon Point, or west extreme of the bay S. W. by S., south extreme of Quail Island W. by S. ½ S., and the east point of the bay E. S. E. ¼ S., off the landing place 1 mile, off the northeast shore 2 cables' lengths.

The winds are generally in the northeast quarter, and frequently the weather is cloudy, with squalls; here it seldom rains, but a dry haze mostly prevails about these islands. In December and January, the winds hang sometimes far to the eastward, but they veer at times in the same season to the northward.*

St. Jago, or Yago, the chief of the Cape Verd Islands, is about 40 miles long and 20 miles broad; it is mountainous and generally sterile, but having fertile spots which produce abundance of fruits and vegetables.

The cistern which supplies the ships with water in Porto Praya Bay, is at the bottom of the hill upon which the castle is built, about a quarter of a mile from the beach, and in common seasons, if drawn dry in the evening, is full again next morning. The water is not very good, being more or less brackish, particularly

* When the weather is settled, there are often regular land and sea breezes in the Bay of Porto Praya; the seabreeze setting in near noon, with a great surf on the shore, and ending at four or five o'clock in the afternoon. The north east wind sets in towards evening, and continues during the night. As there is generally some surf on the beach, boats should lie at their grapnels, and the casks of water be hoisted into them, after being filled at the well or cistern, and rolled down and floated through the surf. His Majesty's ship Polyphemus and Africa, with a fleet of transports, watered at this place in January, 1807, and found the water then very good. Capt. Heywood, advises large ships to send on shore a pump to place in the well, by which they will be sooner watered than if the water were drawn up from it in the common manner with buckets. Some planks carried on shore, will be useful to place under the casks in rolling them down, where the ground is stony or uneven, or where there is soft sand, which is often the case.

in dry seasons. At such times, there is a scarcity of all the necessaries of life, and the wretched natives perish in great numbers by famine. This is at all times an indifferent place for a ship to stop at for refreshments; and in very dry seasons, the water although indifferent, is not to be had in sufficient quantity. The anchorage in the Bay of Porto Prava is in lat. 14° 55′ N. long. 23° 30′ W., by mean of many ships' observations and chronometers. Variation 14° 30′ W. in 1809.

St. Vincent, 5 leagues S. E. of St. Anthony, has wood, water, and wild goats; also said to have anchorage all round it, with a good road called Porto Grande on the north side.

But the bay on the S. W. side of the island is the safest anchorage, on account of the prevailing N. E. trade-wind. Here the Devonshire anchored, in 22 fathoms, sand and bits of coral, on her passage out to India in 1766, about 2½ or 3 miles off shore, and 4 miles from each of the extremes of the island. One well was discovered, and another was dug near it at the head of the bay, where she filled up her water during a stay of several days.

St. Lucia, 3 leagues S. Eastward from St. Vincent, having some rocky islets between them, is of considerable extent, hilly, and not inhabited: at the S. E. part there is a good road, within two small isles called Round and White Islands.

St. Nicholas, 5 leagues S. E. of St. Lucia, is the most pleasant of these islands, and the residence of the bishop: on the south side, there are several anchoring places. Grand, or St. George's Bay, on the N. W. side, has anchorage in 7 fathoms clear ground, close to the shore, but out in 9 and 10 fathoms the ground is rocky. Here refreshments may be procured, but there is no watering place for a ship.

Tarrafal bay, to the S. E. of the former, has good anchorage in 9 and 10 fathoms; and the inhabitants will bring water to the boats on asses.

Bravo, about 18 leagues to the westward of St. Jago, is high, about 4 leagues in circuit, and one of the most fruitful of the group. Porto Furno, on the east side, is a good harbour for small vessels, with a narrow entrance which obliges ships to warp out.

Porto Furreo, on the south side, and Porto Fajen Dago, on the west side, are also good havens, where water and refreshments may be procured.

Fuego, or St. Philip, about 5 leagues long, has a volcano that continually smokes, sometimes throwing out flames and liquid sulphur. It has no running stream, and but a few mulatto or negro inhabitants, who raise vegetables, and rear goats and cattle.

Limits of the Northeast and Southeast Trade-Winds near the Equator, in the different Months of the Year.

Months.	Lost N. E. Trade Outward, in		Got N. E. Trade Homeward, in		Mean Out and Home.	Lost S. E. Trade, Homeward, in		Got S. E. Trade Outward, in		Mean Out and Home.	Diff. of the two Mean Limits of N. E. and S. E. Trades.
	Latitude.	Mean.	Latitude.	Mean.		Latitude.	Mean.	Latitude.	Mean.		
January	5° to 10° N.	7° N.	3° to 6° N.	4½° N.	5¾° N.	½° — to 4° N.	2¼° N.	2° to 4° N.	3 N.	2¾° N.	3°
February	5 10	7	2 7	5	6	2 S. to 3	1½	½ 1	1	1¼	4¾
March	2½ 8	5½	2 7	5	5½	1 2	1	½ 2½	1½	1¼	3¾
April	4 9	6	4 8	5½	5¾	2 2½	1	0 2½	1½	1¼	4½
May	5 10	7	4½ 7	6	6½	1 N. to 4	2½	0 4	3	2¾	3¾
June	7 13	9	7 12	9	9	1 5	3	0 5	3	3	6
July	8½ 15	12	11 14	12	12	1 6	4	1 5	3	3½	8½
August	11 15	13	11 14½	13	13	3 5	4	1 4	2½	3¼	9¾
September	9 14	11½	11 14	12	11¾	2 4	3½	1 3	2	3	8¾
October.	7½ 13	10	8½ 14	10	10	2 5	3	1 5	3	3	7
November	6 11	9	7 0	7	8	3 4	3½	3 5	4	3¾	4¼
December	5 7	6	3 6	5	5½	1 4	2½	1 4½	4	3¼	2¼

The observations are rather few in number for some months, to obtain a correct mean; but the first column showing the extreme limits for each, will be most useful to refer to, as it marks the situations where the trades may reasonably be expected to fail or commence.

The numbers in the last column is the space of variable winds, &c. between the mean limits of the trades. The columns of means do not always exhibit the exact mean of the two extremes for each month, but these mean numbers *incline a little* from the true mean, towards the extreme limit experienced by the majority of the ships.

An interesting description of winds, printed in 1675, by John Seller, hydrographer to the king, reprinted by Mr. Dalrymple, 1807, agrees nearly with the above abstract, in fixing the southern limit of the northeast trade, as experienced in the different months of the year. The remarks relative to the southern limit of the northeast trade, in the treatise mentioned, seem judicious and concise, and are as follows:

"In January, February, and March, the northeast trade-wind bloweth commonly unto four degrees of north latitude, where at that time beginneth the southeast and easterly trade-wind.

In April, the northeast trade-wind bloweth commonly unto five degrees of north latitude, where then beginneth the southeast wind.

In May, the northeast trade-wind bloweth unto 6 degrees of north latitude, where at that time beginneth the southeast wind, somewhat more southerly.

In June, the northeast trade-wind bloweth unto 8 degrees of north latitude, where then beginneth the southerly wind.

In July, the northeast trade-wind bloweth unto 10 degrees of north latitude, where then beginneth the southerly wind somewhat westerly.

In August, the northeast trade-wind bloweth unto 11 degrees of north latitude, where the southerly wind begins somewhat westerly.

In September, the northeast trade-wind bloweth unto 10 degrees of north latitude, where the southerly wind beginneth.

In October, the northeast trade-wind bloweth unto 8 degrees of north latitude, where then the southerly beginneth somewhat easterly.

In November, the northeast trade-wind bloweth unto 6 degrees of north latitude, where the southeast wind beginneth.

In December, the northeast trade-wind bloweth unto 5 degrees of north latitude, where the southeast wind beginneth.

It is to be observed, that between the northeast and the southeast trade-wind, the winds are subject to alteration, which variableness is sometimes found a degree or two sooner or later than the aforesaid latitude; and the more northerly you are, the more is the variableness found to be about the north and the northeast: and the more southerly you are, the more are the winds found to blow about the southeast, and the south."

This observation is partly correct, but it is generally experienced that the southerly winds prevail more than any other throughout the space of variable winds between the trades, more particularly when the sun has great north declination; the homeward bound ships, therefore, are enabled at this season, to cross this space more quickly than the ships outward bound, which they do generally in some degree, at all seasons. Calms and variable winds are also experienced during every month in the year in the space between the trades; the former seldom continue long, and the vicinity of the northeast trade seems most liable to them. Sudden squalls often follow these calms, which ought to be observed with great care, and sail reduced with activity when they are perceived to approach; for many of the East India Company's ships lose their topmasts, and sustain other damage, by these equatorial squalls, which give very little warning.

These squalls are sometimes accompanied by whirlwinds, in their first effort against the resisting atmosphere, and may blow strong for an hour or two; but a gale of wind, or storm of duration, probably never happens far from land, near the equator in the open ocean, on any part of the globe; although in its vicinity, sudden gusts of wind and whirlwinds are experienced at times.

The S. W. and W. S. W. winds, with much rain, often prevail in July, August, and sometimes in June and September, blowing toward the coast of Guinea, and sometimes as far north as the Cape Verd Islands; which winds are called the *Line Westerly Monsoon*, by the navigators who trade to the gulf of Guinea.

DIRECTIONS FOR SAILING FROM THE CAPE VERD ISLANDS ACROSS THE EQUATOR:

Islands in the South Atlantic, or Ethiopic Ocean.

THERE are many journals which tend to prove, that the northeast trade-wind is deflected by the projection of Cape Verd to the westward, and that ships which keep near the coast of Africa, lose the trade sooner than others which are at a greater distance from the coast. To guard against this, it is recommended by many commanders, to keep well to the westward at the time the northeast trade fails, with a view to continue it longer, to have fewer calms and baffling winds in the variable space, and to meet the southeast trade-wind sooner than if more eastward. By adhering to this precept, several ships have crossed the equator far west, then meeting with

the southeast trade hanging far from the southward, and strong westerly currents, have made the Brazil coast, about Cape Roque, or farther to the westward, which greatly prolonged their voyage.

In the summer months, particularly when the sun is in the northern hemisphere, outward bound ships should not run too far to the westward; for in this season, it has sometimes happened, that the northeast winds have continued longer with ships in long. 19° to 23° W., than with others which had separated from them, and lost the trade in 26° and 27° west longitude.

On whatever side of the Cape Verd Islands ships may pass, the most eligible situation at losing the northeast trade, is *probably* from long. 18° to 23° W.

When the sun is near the northern tropic, the trade often fails ships near, or in sight of these islands; it is certainly best to pass to the westward of them at such times, at 8 or 10 leagues distance at least, to preserve the steady wind, and prevent delay, as light eddy winds prevail near, and amongst them in this season. When to the southward of the Cape Verd Islands, steer to the southeastward, if the wind permit, and endeavour to get into longitude 18° to 23° W., at losing the northeast trade. If then the southerly winds commence, take advantage of the shifts to stand on the tack which gains most southing, and endeavour to cross the equator from 18° to 23° W., if the winds permit; but do not be induced to make a long tack either eastward or westward, with a dead southerly wind, in hopes of meeting a better, unless the wind should veer so far as to gain much southing.

The southeast trade, generally at its northern limit inclines far to the southward, particularly in July, August, and September; and the same has been known in other months. When a ship meets this trade, she should not be kept too close to the wind, or she will make little progress, but ought to be kept clean full, to enable her to make good way through the water to the southwestward, by which means she will soon get to the southward of the limits of the westerly* current prevailing about the equator, and to 4° or 5° north latitude: it also extends to 3° or 4° south latitude about Fernando Noronha; and from longitude about 27° W. to Cape Roque, it runs very strong, particularly from September to March.

In proceeding to the southward, the wind will draw more to

* In winter, the currents sometimes from the Cape Verd Islands set easterly, and sometimes westerly to 4° or 5° N. latitude, at other times they are variable; but to the southward of 3° or 4° N. latitude, and westward of 20° or 22° West longitude, the equatorial current perpetually runs to the westward.

the southeast, and finally to east and east-northeast at the southern limit of the trade.

WARLEY'S SHOAL, is described by Captain Collins, of that ship, to be a small coral bank (which she passed over, at 7 A. M. May 7th, 1813) about 100 feet long and 50 feet broad, which was too distinctly seen to admit of any mistake; for its edges were clearly delineated, and upon it several ridges of rock appeared, with sand between them. The ship passed too quickly over it to admit of time to sound, as it was accidentally seen by Captain Collins, when looking over the quarter. He thinks there may be full 7 fathoms water over the shoalest part; and a quarter-master, who also saw it, thinks the least water on this shoal may probably be 10 or 12 fathoms.

The fleet at this time consisted of 8 ships, including H. M. S. Salsette, their convoy; and by mean of all the observations and chronometers of those 8 ships, this doubtful rocky bank is situated in lat. 5° 4′ 23″ N., lon. 21° 25′ 40″ W. It is matter of regret, that it was not carefully examined, so as to have established its real existence.

It might have been a shoal of Devil-fish, which the Warley passed over, as they are gregarious, and very large near the Equator; and as they swim at great depths, their variegated backs appear exactly like coral rocks.

ST. PAUL'S ISLAND, called also Panedo, and St. Peter's, in lat. 0° 55′ N. lon. 29° 15′ W. by mean of many ships' chronometers and lunar observations, is now correctly determined, as this small island has been seen by ships both outward and homeward bound, although it is considerably to the westward of the *common* route of the latter, and no ship bound to the southward, should cross the equator so far west as this island.

The Tellicherry passed within 5 miles of it, May 17th, 1802, bound for India. A view was taken, when it bore from N. 30° W. to N. 37° W. distant 5 or 6 miles; by this view, St. Paul's seems to be a heap of rugged rocks, having low gaps between some of them; the northernmost is a small pyramidal rock, not so high as the others. The description annexed to the view in the journal, says, "This island is all rocks, about the height of a ship's mast out of the water.*

Mons. de Landeneuf, in the ship Le Curieux, was sent to explore this island in 1768. His account and the Tellicherry's are similar. He found it consisted only of a heap of steep rocks, covered with birds' dung, without verdure, and had no place fit for anchoring, nor convenient for landing.

The variation off St. Paul's was 6° W. in 1802.

* It is about 35 feet elevated above the sea, and consists of a group of several rocks adjoining each other, with soundings of 30 to 80 fathoms near them, as found by a commander of the navy, who surveyed and landed on it in 1813.

Fernando Noronha, has not unfrequently been visited or seen by ships bound to India, occasioned by the currents having horsed them to the westward, after the failure of the north-east trade. This island has on it a high rocky peak, called the Pyramid, which is very remarkable, and seems to lean or overhang to the eastward, when it bears S. S. W. The S. W. point is perforated, off which is a sunken rock at a considerable distance, dangerous to approach. From the S. E. part of the island a reef extends to seaward, and some sunken rocks at nearly a league's distance from the shore. There is also said to be a reef, on which the sea always breaks, about 3 miles from the east part of the island, with a channel of 10 to 15 fathoms within it, and that the pyramid is shut in with the highest hill when upon the rocks.

The currents generally run strong to the westward about Fernando Noronha, therefore ships intending to anchor here, should always pass round the north end of the island, which is formed by a chain of several small islets, very near each other, having forts on some of them that command the anchorage.

This island extends nearly 10 miles about S. W. and N. E. and is about 2½ miles broad; the shore is rocky and the surf frequently high; at such times there is no landing. It is not adviseable to touch at this island, except in cases of necessity; for it appears that water is a scarce article in the dry season, and when procurable, cannot always be got off from shore on account of the surf. There is little rain, and they have been sometimes two years without any, then the rivulets were dried up, and vegetation quite parched; at such times, it cannot be supposed a ship would obtain much benefit by stopping at this place.

The General Stuart anchored at Fernando Noronha, September 15th, 1803, (outward bound) in 18 fathoms water, the N. E. end of Wood Isle E. N. E., the S. W. end of Fernando Noronha S. W. by W., the Peak S. by W., Water Bay S. ½ E. off shore about 2 miles. She remained here four days, and could procure only nine casks of water, the well being nearly dry.

November 20th, 1805, the Ann, outward bound, anchored in 17 fathoms shells and rocky bottom, extremity of Fernando Noronha from E. N. E. to S. W. by W., the Peak S. by W., the Church and Round Castle S. by E., the large Fort E. S. E., off shore 2 or 2½ miles.

November 22d, 1805, the Tigris anchored in a ¼ less 9 fathoms, sand and rocky bottom, Cloven Rock N. E. ¼ N., Fort Island N. E. by E. ¾ E., Fort Remedios S. S. E. ¼ E., Pyramid S. W. ½ S., western extreme S. W. by W. ½ W., off shore about half a mile. These ships sailed in company 24th; the

Tigris received 3 bullocks, the Ann received some stock and 12 butts of water, but they found great difficulty in getting the water from the shore, the surf being very high.

There is good anchorage in 13 fathoms, fine white sand, off shore about 1 mile, with Fort St. Antonio E. by S. ½ S., Fort Remedios S. by W., Fort Conception S. S. W. ½ W., Pyramid S. 42° W. The road of Fernando Noronha is unsafe to lie in, with northerly or northwest winds, which are said to prevail from December to April; at other times, they are mostly south-east or easterly, and sometimes at northeast. The well which supplies ships with water is near the governor's house, but landing the casks and getting off the water is inconvenient. The wood is cut on a little island near the north point of the large one, but is not conveniently got into the boats on account of the rocky shore.

Fernando Noronha is peopled with exiles from the coast of Brazil, and is well defended by forts built on the places most eligible for its security. It is hilly uneven land, and seen at 10 leagues distance in clear weather.

The Pyramid is in lat. 3° 55′ ¼″ S., long. 32° 35′ 30″ W., by mean of many ships' observations and chronometers. The tide rises about 6 feet, and flows to 4 hours on full and change of the moon. There is very little variation at present, 1816.

Roccas, is a very dangerous low isle or reef, a little above water. Ships which pass between Fernando Noronha, and the Brazil coast, should be cautious in the night, if not certain of their relative position from Fernando Noronha; for the strong westerly currents are liable to carry them more to leeward than may be apprehended. As this shoal has proved fatal to the East India Company's ship Britannia, and King George transport, which ships were wrecked on it, at 4 A. M., November 2d, 1805, it may be proper to describe and show the true situation of this dangerous reef.

The Earl Elgin saw it in July, 1761, having first seen Fernando Noronha on the 13th, and on the 19th she had soundings on the bank off Cape Roque; at noon 23d, the Roccas bore E. ½ N. to E. ¼ S. distant 4 miles, latitude observed 3° 50′ S. This ship's longitude, by account, placed the Roccas 2° 12′ E. from Fernando Noronha, whereas it is about 50 miles west of the island; she had therefore experienced a westerly set of 3° 2′ in 10 days. In the Earl Elgin, they call it a low island, or more properly a shoal, that cannot be seen at 3 leagues distance; a sand bank, surrounded by rocks, with high breakers mostly all round, and a projecting point of breakers at the north and south ends of the shoal.

By the Portuguese, the Roccas is said to bear west, a little northerly, distance 15 leagues from Fernando Noronha.

Captain I. Birch, who commanded the Britannia, says, "the Roccas are certainly not laid down right in any of the charts; they are only distant from Fernando Noronha 45 miles; their latitude the same as that island; the rocks most dangerous, are to the northward and northeastward; the whole extent may be about 5 miles; the current set 2½ miles per hour to the westward; rise and fall of tide 6 feet."

In the fleet, several ships narrowly escaped the fate of the Britannia and King George, having separated several days before. The Leda frigate, with one division, led past the shoal, and just cleared it, when the Britannia and King George were wrecked. Several ships of the other division, under Sir Home Popham, saw the shoal on the following morning.

The Northampton's journal describes it as a dangerous shoal, very little above water, with breakers all round, except on the southwest, or lee side, there appeared a white sandy beach, where a boat might land. The Glory's journal describes it as 2 low sand banks, when it bore S. S. E. 2 or 3 miles; and when on the west side of it, at 2 miles distance, she had ground 28 fathoms, coral rock.

By mean of the observations and chronometers of 10 different ships, the Roccas shoal is in lat. 3° 52′½ S. lon. 33° 31′ W.*

MARTIN VAS ROCKS, are high and barren, the central one is largest, and may be seen from a large ship's poop at 11 leagues distance; this is a little more easterly than the other two, although they are nearly on the same meridian, as they are all in one, bearing south. The northernmost and central rocks are near each other, but between the latter and the southernmost, there is a channel, through which the Chesterfield passed in March, 1800, and observed the lat. 20° 28′ S. when in mid-channel. When through, she hove to, in 12 fathoms, with the largest rock bearing E. N. E. about 1 mile distant, the bottom then visible, and caught plenty of rock-cod and other fish: the boat in sounding, found the depth decrease gradually over a rocky bottom, to 1½ fathom close to the largest rock.

The north rock is small, and the most westerly of them; they are all steep and inaccessible, and the distance between the two extremes is about 3 miles.

The breadth of the channel between these rocks and the island Trinidad is about 8½ leagues.

* In some charts, a shoal is placed about 25 leagues southwestward, and another about 45 leagues W. N. W. from Fernando Noronha; probably these shoals do not exist, as several ships have passed over the places where they are laid down, without seeing any appearance of danger. The Sir Edward Hughes, in June, 1802, passed directly over the position assigned to the southernmost shoal; keeping a good look out, but saw no indication of danger.

By mean of the observations and chronometers of 12 different ships, the central Martin Vas Rock, is in lat. 20° 28′ 30″ S. lon. 28° 42′ W. Variation 3° W. in 1797.

Trinidad, is about 6 miles in circumference, extending nearly southeast and northwest; it is high and uneven, and just discernible from a large ship's poop in clear weather, at 18 leagues distance. It is rocky and barren in general, but in some parts, there are trees about 12 or 18 inches diameter on the heights, particularly about the south part of the island. The shore is rocky and of difficult access, occasioned by the high surf that continually breaks out in every part. At the east and southwest sides of the island, good water runs down in two small streams, it may also be procured at times from the rock that forms the southwest extreme. Excepting the times when rain prevails, these runs are very small, and it seems probable, that they may in some seasons be nearly dried up, if not entirely so. Ships should not stop at this island for water, unless they are greatly in want of that article, for the difficulty of getting it from the the shore is great: the anchorage is also unsafe, as the winds are often variable, and should a gale happen from west or southwestward, they would be in danger of driving on the shore. Although Trinidad is within the southern tropic, the southeast trade-wind is not regular; northeast and northerly winds often happen, particularly the former, and sometimes hard squalls or southwest gales have been experienced, which render the anchorage at this island hazardous.

The Georgina packet anchored in October, 1799, at the northwest end of Trinidad, in 19 fathoms, fine black sand, and moored off shore about 3 cables' lengths; the extremes of the island from east to south, a large rock detached from it about a quarter of a mile, S. S. W. ¾ W. about three fourths of a mile; found 10, 11, and 12 fathoms, coral, between the rock and the shore. The surf being great, they landed at one place with difficulty, and shot some wild hogs; good water was found about half a mile inland, but it seemed almost impossible to get it from the shore on account of the surf, and must have been carried about half a mile in small kegs had they been in immediate want.

It is recommended for ships that may be obliged to stop at Trinidad, to endeavour to procure water, to anchor in 30 fathoms, about a mile from the west part of the island, that they may be able to clear it on either tack, should the wind blow from westward; for the Rattlesnake was wrecked in a westerly gale, and the Jupiter and Mercury narrowly escaped destruction. On this side, almost detached from the island, there is a rock about 850 feet high, with trees on it, called the Monument or Nine Pin; it is of a cylindrical form. There is also a stupen-

dous arch, which perforates a bluff rock, about 800 feet high; this is about 40 feet in breadth, near 50 feet in height, and 420 in length; the sea breaks through the arch with great noise, and there are more than three fathoms water under it, and in the basin formed at its east side. At the southeast end of the island there is a rock of a conical form, about 1160 feet high, called the Sugar Loaf, with trees likewise on its summit, and whenever it rains hard, a beautiful waterfall of above 700 feet is projected from it.

Captain Charles Lesley, of the Orford man of war, in his Journal of 1773-4, mentions three bays at the south and southwest sides of Trinidad. He recommends the easternmost as the best, the western or middle bay being rocky, and the northernmost having shoal water in it. The easternmost bay must be situated at the southeast part of the island. Captain Lesley says, a church, with a cross on it, stands at the upper part of the bay, and that a ship may anchor in 6 fathoms, the church bearing W. S. W. and a point like the South Foreland S. W. by W. and may moor with one cable on shore.

The watering place, he describes to be near the church, and that a longboat may fill the water there with a spout or hose.

Notwithstanding this description of the bay at the south part of the island, it would certainly be imprudent for any ship to to anchor there with the southeast trade-wind, and it probably ought never to be done unless the weather is very settled, and the wind fixed at northward; at all events, no navigator would approach so near as to moor with a cable on shore, except this were a safe harbour, which it certainly is not. Perhaps there is, at present, no vestige of a church at this place.

Trinidad is often seen by ships passing to the southward, through the southeast trade, but is seldom visited by navigators, on account of its unsafe anchorage.

The Chesterfield rounded the north end of the island, very close, in March, 1800, and her boat went all round it, which appeared to be steep, and bold to approach, she anchored in 25 fathoms, with the Nine Pin bearing N. N. E. 1 mile: they could only land at one part about a mile from the watering-place, on account of the surf, and although good water ran down within fifty fathoms of the shore, they could only get it to the longboat moored outside of the surf, by filling canvass bags, holding about ten gallons each, and hauling them off by a circular rope of communication, rove through a block in the boat. H. M. S. Bristol, anchored here about 30 years ago, and filled about 30 tons of water in one day, with a long hose, when there happened to be little surf. The Chesterfield got about 30 young hogs, which were very good; there are many wild goats on the island, but so shy, they cannot be caught.

By mean of the observations and chronometers of ten different ships, the centre of the island Trinidad, is in lat 20° 22′ 30″ S., and in lon. 29° 10′ W. Captain P. Heywood, of the royal navy, made it 23° 38′ west of St. Helena, by means of 4 chronometers, which would place it in lon. 29° 13′ W; and some observers place it a little more westerly.* The Chesterfield made the variation 2° 18′ west in 1800.

Ascension Island, placed formerly in the charts between Trinidad and the coast of Brazil, is now known not to exist.

Island Ascension is about three leagues in length from N. to S. and 2 leagues broad E. and W. and may be been 15 leagues or more, in clear weather, there being several peaked hills on it; the highest, called Green Mountain, is situated near the S. E. part of the island, about 800 yards high, and appears a double peak in some views. Most of the hills are covered with red earth, like brick dust, being a decomposition of the volcanic rock, which forms this island. It has a most dreary aspect, the surface consisting of calcined rocks and pumice stones, dangerous and difficult in some places to walk over, as they have little solidity, and are often sharp-pointed and rough. There is no verdure except purslain, which grows mostly about the Green-Mountain, and is found in April, May, June, and July. Captain Dampier (whose ship was lost on this island) is said to have discovered a spring of fresh water on the S. E. side of the High Mountain, about half a mile from its summit. At that time, 1700-1, he found plenty of goats and land crabs, near the spring of water: other navigators have not been so fortunate as to discover any spring on the island, but have found some rain water in the hollows at the base of the mountain, which is probably evaporated in the dry season. The wild goats are very lean; rats and mice abound, and there are a few insects. The summit of the mountain is frequently enveloped in clouds or vapour, but it seldom rains here.

This island is seldom visited, unless by a few ships homeward bound from India, or whalers, who stop here for a supply of turtle. These were formerly in plenty, particularly in February, March, and April; but of late, so many American and other vessels have touched at this island, that turtle often cannot be obtained.

There is a bay of considerable depth and extent, close on the north side of the S. W. point of Ascension, about two and a half or three miles distant from the two bays where ships anchor. Captain Heywood found the landing very safe in February at this bay, went to it in his gig, on the nights of the

* Captain Flinders made the S. E. point in long. 29 degrees 19 minutes W. by lunar observation, and 29 degrees 23 minutes W. by chronometers.

24th and 25th of February, and turned 36 large turtles, whilst very few could be obtained by the people stationed at the bays contiguous to the anchorage. A ship intending to stop at Ascension, should stop in the usual place, and send parties to the westward round the extreme point, which bears about S. S. W. from the road; two or three sandy beaches will then open, the farthest of which is S. W. bay, and as this bay is not frequented, nor much known, a large supply of turtle may reasonably be expected.

A ship intending to stop at Ascension, should steer round the N. point of the island, which is a low rocky point with deep water close to it, and may be passed within two cables' lengths with a commanding breeze: when abreast this point, Sandy Bay will soon be seen a little to the S. W., which is a small bay, with a white sandy beach, having a regular hill like a dome a little distance inland; this is called Cross Hill, from a cross placed there more than half a century back.*

From the W. point of Sandy Bay, a reef of rocks projects out about 1 and a half mile, on which the sea breaks when there is much swell; at other times, there are no breakers on it. When a ship has passed the N. point of the island, she should haul up into the Sandy Bay, and anchor abreast of the beach, in 16 or 16 fathoms sandy bottom, with Cross Hill S. by E. ½ E. or S. S. E. off shore about three-fourths of a mile.† The best landing place is at the W. end of the bay, behind an isolated rock: this rock makes a sort of division between the Sandy Beach Bay, and another bay to the westward, which has also a sandy beach in some places, and may be considered a continuation of the easternmost bay. In this western part, there are some detached rocks; on one of which the Egmont struck in 1771, which was found to be a very small rock with ¼ less 3 fathoms on it, and 13 fathoms close to it on the outside; there was 13 fathoms between it and the shore, from which it was distant about two cables' lengths. The summit of the rock, where the depth on it was ¼ less 3 to 5 fathoms, was not of more extent than 4 or 5 feet square. The bearing of this rock from Cross Hill is not known; Captain Mears says it lies in the opening of the second sandy bay from the anchoring place under Cross Hill, the hill bearing from it, by compass, S. W. ½ S., appearing over the low land. This bearing does not agree with the description; probably it should

* Captain Heywood erected a flagstaff on the summit of this hill in 1811, as he found the cross gone.

† Along the N. W. side of the island, the bank of soundings extends about 2 miles off shore; the bottom said to be rocky, where the depth exceeds 18 or 20 fathoms.

have been S. E, ½ S. Although the anchorage is to leeward, at the N. W. part of the island, there is often a high surf on the shore; caution is therefore requisite, as many ships have had their boats stove by the surf in landing. The summit of the mountain, or centre of the island, is in lat. 7° 58½′ S. and the anchorage of the road in lat. 7° 55′ S. lon. 14° 15½′ W. measured by many ships' chronometers from James's Town St. Helena, allowing the latter to be in lon. 5° 36½′ W. Captain Heywood, made it also, in the above longitude, and in 14° 16′ W. by chronometers, measured from St. Anthony, one of the Cape Verd islands. Variation 12° 30′ W. in 1806. There is very little rise or fall of tide.*

It has sometimes happened that outward bound East India ships, after crossing the equator, have found the S. E trade so far to the eastward, as enabled them to pass in sight of the Island Ascension; this can only happen to ships which cross the equator far eastward of the common track, when the sun is near the southern tropic. The trade-wind is then at times E. by S. or E.; and at such times, a south course may probably be made, by keeping close to the wind in crossing the trade, although ships bound to India, or the Cape of Good Hope, should not adopt this route with a view of shortening the distance; for their principal object is to get quickly through it, into the northerly and westerly winds, where they will soon run down the longitude.

Although Ascension is seldom seen by ships bound to India, it is directly in the route of those homeward bound, for they generally see it in passing, particularly in times of peace, when no danger is apprehended from cruizers.

St. Helena is situated in the southern Atlantic Ocean, in the strength of the S. E. trade; but it is not the island most distant from its nearest continent of any in the known world,

* In places where the shores are lined with a sandy beach, and this bounded by a coral reef or range of breakers, turtle are generally plentiful; and moonlight nights are the times when the females come on shore in the greatest numbers, to deposit their eggs in the sand. If there is a reef facing the beach, and a rise and fall of tide, they wait for the rising tide to float them over it, and reach the beach an hour or two before high water, that they may have time sufficient to dig large holes in which they deposit their eggs, and return to sea about high water, or before it has fallen much on the reef. If the beach has a gentle acclivity, they dig the pits at a considerable distance from highwater mark, among bushes, small sand hillocks, or in the most convenient secret places near the beach, and then deposit their eggs in them. Some of these holes or pits are of considerable dimensions, employing the mother turtle upwards of an hour digging them. By those in search of turtle, the beach should not be frequented till near highwater, or the time they are supposed to be mostly on shore. In walking along it, silence should be observed, for the smallest noise will alarm them, and those not already on shore, will in such case return to sea.

as has been said; for, exclusive of the islands in the Pacific Ocean, St. Paul's, Kerguelens, Tristan de Acunha, and others, are more distant from the continents than St. Helena. Before the use of chronometers and lunar observations, navigators were directed, in running for St. Helena, to fall into its parallel 50 or 60 leagues eastward of it, to lie by in the night, and steer west in the day till they made the land. This practice is no longer requisite, for most of the East India ships, homeward bound, steer now a direct course from the Cape to St. Helena, and make the island day or night: as they generally know the longitude within a few miles of the truth, there can be little danger of missing it, although this is barely possible, the body and leeward part of the island being frequently in fog clouds, particularly in the night. Should a ship, in such case, fall a little to leeward, she will seldom find any difficulty in working up to the anchorage, unless she sail indifferently upon a wind, for the current seldom runs *strong* to leeward near this island; this, however, may happen, when the wind blows strong with squalls for a few days, which is sometimes experienced about the full and change of the moon; but this lee current is generally of short continuance. In times of war, when any of the enemy's cruizers visit St. Helena, they keep to the eastward and southeastward of it, at the distance of 15, 20, and 25 leagues; single ships, which sail well, would avoid these cruizers, were they to make the island bearing from N. N. E. to E. or S. E. and afterwards make short tacks under the lee of it, till they reach the anchorage. I have seen store ships from England, make the island bearing E. S. E. directly to windward of them, at the distance of 15 or 18 leagues; they sailed indifferently, but reached the anchorage the third day after making the island. There are sometimes calms near it; the Mead was becalmed from the 17th to the 22d May, 1710, within 6 and 8 leagues of the east part of the island, the current setting to the eastward, prevented her from being driven near it by the swell, and she did not get into the anchorage till the 24th of May.

This island is about 3 leagues in length, nearly N. E. and S. W., of a circular form, about 26 or 27 miles round. The steep rocky cliffs facing the sea, present a sterile and unfavourable appearance to an observer in sailing round the east part of the island, but the chasms or vallies in the interior, and likewise the hills, are fruitful and clothed with continual verdure, except in very dry seasons, when it is sometimes burnt np for want of moisture. The principal ridge of mountains in the centre of the island is called Diana's Peak, and is about 2200 feet high. Nearer the S. W. part there is a hill of a conical form, called the High Peak, about 50 feet less elevated than the former. On these hills, and on the high grounds, the air is always cool and

pleasant; fog clouds frequently cover the Peaked Hills, or, being driven from the sea by the trade-wind, strike against them, producing gentle showers, which quicken the vegetation and cool the atmosphere on the high grounds, although in the vallies on the leeward side of the island, the sun is often very powerful. There is very little level ground on this island, for it evidently appears to have been forced upwards from the the ocean by subterraneous fire; the abrupt ridges and chasms into which it is split, seem to prove this origin, and the effects of amalgamation by fire are visible from the summits of the hills to the cavities formed by the abrasion of the surge of the sea at the water's edge.

Thunder is seldom heard at St. Helena; lightning has been at times observed in cloudy weather, accompanied by a sultry atmosphere; showers of rain are experienced in all seasons, but in some months more than others. A few years back a a heavy condensed cloud broke on the mountain over Rupert's Valley, deluged it with a torrent of water, and carried a great part of the breast-work and some of the guns into the sea, although this valley is generally dry, there being no run of water in it, except in heavy rains.*

At the northeast extremity of the island, there is a pyramidal hill close to the sea, called the Sugar Loaf, with a signal post on it. At the base of this hill there are three batteries, at a small distance from each other, called Buttermilk, and Bank's upper and lower batteries; a little to the southwest of these, Rupert's battery appears at the bottom of the valley of this name, which is a strong stone wall and battery, mounted with heavy cannon, and Munden's Point divides this valley from James's, or Chapel Valley, where James's town, the only one on the island, is situated. On Munden's Point there is a fort of the same name, and several guns placed on the heights over it, which command that side of James's Valley. This valley has on the southwest side, a hill elevated nearly 800 feet perpendicular from the sea, called Ladder Hill, with a heavy battery of guns upon it, that commands the southwest entrance to the valley and anchorage. James's Valley is also protected by a wall, and strong line of cannon at its entrance close to the sea. There is also a battery at Sandy Bay, on the south side of the island, where boats might land when the surf is not great; but this and every other part, where there is a possibility of landing, are well secured by batteries or guns placed on the heights over them, and on the summits of the

* Hitherto the inhabitants of this island have escaped that dreadful scourge the small-pox, but the meazles were transported by some ship to this place in 1806, which have swept away nearly one third of the natives.

hills there are convenient signal posts all over the island, which communicate by telegraph with each other and with the castle, which add greatly to the natural strength of the island. When a ship is descried, a gun is fired at the signal post where she is first seen, and this is repeated by the other posts to the castle, which is called an *alarm*; if more ships appear, a gun is fired for each, till five in number, then the signal is made for a fleet; but if more than two sail appear to be steering together for the island, *a general alarm* is beat, and every person immediately takes the station assigned him, and remains under arms till the governor is informed by the boats what ships they are.

All ships coming in from the eastward, heave to, before they pass Sugar Loaf Point, and send a boat with an officer to report them. The boat is generally hailed from the battery at Sugar Loaf Point, but she must proceed to James's Town, to give the governor information, before the ship is permitted to pass the first battery at the Sugar Loaf. Ships of war, and all others, must observe this precaution, or the batteries will open upon them and shut them out from the anchorage, which is well defended by the forts and batteries around.

When the boat is perceived returning, a ship may make sail, and pass within a cable's length, or less, of Sugar Loaf Point; she should afterwards keep the shore close aboard in passing Rupert's Valley, with the head-sails braced well forward, as the gusts of wind from the high land veer several points, and may take the sails aback, if precaution is not taken to prevent it. When past Rupert's Valley, Munden's Point ought also to be kept pretty close to; but care must be taken to avoid the *sunken* rock lying off the fort, about 30 or 40 yards from the point—on which, by borrowing close to the shore, the Lascelles, Fox, and other ships have struck, and were nearly lost: several years past, there has been a small buoy with a red flag placed over this rock. When Munden's Point is passed, James's Valley and Town appears, off which is the proper anchorage. There are no soundings to the eastward of Sugar Loaf Point, till close to the steep cliffs: the bank of soundings begins off Rupert's Valley, and extends along the northwest side of the island to the southwest extremity, called Horse Pasture Point. Lemon Valley is about 2 miles to the southwest of James's Valley, and has a run of good water in it; but it is difficult to water at this place, on account of the surf and rocky shore. Ships do not anchor off this valley, it being distant from the town. Abreast of Rupert's Valley they sometimes anchor, but the ground is not so good as abreast of James's Valley and Ladder Hill; here the bank extends about a mile from the shore, shelving with a steep declivity, when the depth is more than 40 fathoms. It is not prudent to anchor in deep water near the edge of the

bank, for the gusts of wind from the Valley are liable to start the anchor when a ship lies far out; should this happen, it would avail nothing to let go another anchor, for the steep declivity of the bank would prevent it from taking hold of the ground. This I have seen several ships experience, and drive off the bank with two anchors down, and all the cables veered out, which occasioned great exertion and fatigue to recover them, and afterwards to work up to the anchorage.

Should a ship anchor in 35 or 40 fathoms water, and the anchor not hold, all the cable may be veered out, to make her ride if possible, till a convenient opportunity offer to warp farther in; but a second anchor should never be resorted to, for if she will not ride fast with one, it ought to be hove up, then sail set, to work her in by short tacks, under lee of the island, till she gain proper anchorage.

Abreast of James's Valley, the anchor may be dropped in from 8 to 15 fathoms, with the flag-staff on the castle in James's Town S. S. E. or S. E. by S. The anchorage is equally good off the east corner of Ladder Hill, or abreast of it, with the flag-staff about E. S. E. If a ship anchor in less than 14 fathoms off Ladder Hill, she should be kept at a short scope of cable, till a kedge or stream anchor is laid out in the offing to moor by, for light eddy winds and calms prevail under the hill; she may therefore be liable to swing with her stern in shore and tail on the rocks, if there is much cable out and the anchor under 14 fathoms. In weighing from under the hill, the inner anchor must be first taken up, to prevent tailing on the rocks, which happened to the Melville Castle, and other ships. Ships generally moor with a stream or kedge anchor to the offing, and sometimes with a bower anchor; those in the stream of the valley, seldom swing with their sterns towards it, for a continued breeze, and frequent gusts of wind blow from it to seaward.

When the wind is light, the ships swing with their heads to the eastward and westward alternately at times, this being the effect of a current or sort of tide; but this tide is very weak, and the rise and fall on the shore at full and change of the moon, is not more than two or three feet perpendicular.

James's Town, is situated in the entrance of the Valley, almost obscured by the impending rocky mountains enclosing it; a row of trees behind the ramparts, and another behind the governor's house, give it a pleasing appearance; the houses are neatly built on each side the principal street, which lies in a direct line up the Valley; higher up, there is a long walk between two rows of trees, having an enclosed square on the left side, and terminated by a garden belonging to the company. There is a run of water in James's Valley, proceeding from a small run on the left-hand side, and from a water-fall, which pours

over a concave precipice, about 200 feet perpendicular, into an ancient volcanic crater at the head of the valley. Water cresses are often plentiful about the edges of this run of water, and are very serviceable to ships with scorbutic crews.

On the right side of the valley, a zigzag road has been cut out with great labour, for ascending Ladder Hill; persons on horseback, and carts, can pass up and down it with safety. This road leads to the governor's country house, and to the south-west parts of the island.

On the left side of the valley, there is a good carriage road, called Side Path, which leads to the interior, and to the eastern parts of the island; other cross roads join these two, and lead to the various plantations. The interior forms a beautiful contrast to the rugged steep cliffs which surround the island; for here, in every valley, small houses and gardens are seen with excellent pasture, and sheep or cattle feeding in different places.

Near the east side of the island, the plantation called Long Wood, contains the greatest quantity of level ground; there is a considerable space planted with trees here, but a scarcity of water prevailed, until General Beatson, the late governor, brought a supply by artificial means.

The water that supplies the garrison and shipping, is conveyed by leaden pipes from a spring in the valley, distant more than a mile from the sea. These pipes lead the water to the jetty, where there are two cranes for boats to load with goods or water casks, or receive stores from the shipping. Fire-wood cannot be had in sufficient quantity, furze being the principal fuel of the islanders, and is brought from a great distance by their slaves. Cabbages, potatoes, carrots, turnips, and other vegetables and fruits thrive well, but are sold dear, and not in sufficient quantity to supply half of the shipping, which at times anchor here, to procure water and refreshments. All the vegetables are cultivated by the slaves, who are indolently inclined. Were a few industrious farmers or gardeners to use a small plough or two, for planting a few acres with cabbages, turnips, carrots, and potatoes, in some of the valleys where the soil is good, the supply of these useful vegetables would then be sufficient, for all the scorbutic crews of ships which annually visit the island, and produce most beneficial effects; and these articles might be easily conveyed from the interior, in light open carts; whereas at present, what is cultivated is carried by the slaves. The quantity of ground requisite for this purpose would be so small, that it could not be considered as diminishing the pasturage for the cattle, which every where abounds.

Cattle are reared for the use of the company's ships, and supplied to them very sparingly when a fleet arrives, the quantity reared not being adequate to the demand; a greater num-

ber it seems cannot be reared, for in very dry seasons, the pasturage has been sometimes destroyed, and numbers of the cattle have died. The troops live mostly on salt provision brought from England, and on fish, with which the shores abound. Poultry is generally very dear, and frequently not to be had. A few hogs may at times be obtained at a high price, which, with a few bushels of potatoes, are almost the only articles procurable when a fleet has recently departed, or is lying at the island.

During the time a ship or a fleet remains at St. Helena, the passengers are entertained as boarders by the most respectable of the inhabitants, at 30 shillings per day for each person. Until lately, one guinea was the daily charge for each person.

James's Town is in lat. 15° 55′ S. and by mean of 32 sets of ☉ ☽ ✱ I made it in 5° 36½′ W. longitude. Captain Mortlock, by many sets of lunar observations, made it rather less; and Capt. Krusenstern, the Russian circumnavigator, made the anchorage in lat. 15° 54′ 48″ S. lon. 5° 35′ 40″ W. Variation 17½ West in 1812.

ABSTRACTS AND REMARKS, ON PASSAGES TO AND FROM ST. HELENA.

1st. *Eastern Passage.*

EAST INDIA Company's Ship Britannia, Nov. 11th, 1803, got soundings on the African Coast, in lat. 29° N. lon. 12° W. Here she was several days embarrassed with S. Westerly winds in soundings, and near the coast, till in lat. 27° N. lon. 13° 20′ W. Nov. 15th, lost sight of the land: the weather was unsettled, and a heavy swell prevailed near the coast. She passed between the Island Fortaventura, and the main land, and between Cape Verd, and the islands of that name. Nov. 25th, in lat. 13° N. lon. 20° W. lost N. E. trade; then ensued calms and faint southerly airs. Dec. 28th, in lat. 4° 40′ N. lon. 9° 40′ W. got soundings 43 fathoms on the Coast of Guinea. At noon in 50 fathoms, latitude observed 4° 40′ N. lon. 9° 4′ W. by lunar observations, and 8° 59′ W. by chronometer. Calms and faint breezes continued, with a current to the northward, till January 8th, 1804, in lat. 3° 20′ N. lon. 1° 38′ W.; then a moderate S. W. breeze commenced, which carried her to latitude 1° N. lon. 4° 30′ E., January 12th. From hence, the wind continued between S. W. and S. by E. till in lat. 3° S. lon. 6° 30′ E. on the 23d; had then a return of calms and faint airs: the current set now, to N. Westward. With a moderate southerly breeze on the 28th, stood to the W. S. W. and westward; it continued till Feb. 1st, in lat. 7° S. lon. 1° W. and veered to S. S. E. and

S. E. by S. a moderate trade, which continued till in lat. 24° S. lon. 10° W. February 15th. Had calms and faint airs, till the 27th, in lat. 26° S. lon. 5° 46′ W. then a return of the trade, which enabled her to reach St. Helena, 4th March.

City of London, left the Isle of Wight, Feb. 1st, 1803, and passed to the westward of Madeira and Canary Islands; then to the eastward of Cape Verd Islands, on the meridian 19½° W. in passing them. Lost the northerly winds Feb. 20th, in lat. 7° 50′ N. lon. 16° 40′ W.; had then faint airs from the northward and westward, till in lat. 5° 20′ N. lon. 11° W. the 25th; light S. W. and southerly airs then commenced, and increased to a moderate breeze when about 26 leagues southward from Cape Palmas, March 5th, which continued till in lat. 3° S. lon. 5° 30′ E., the 16th. Had then S. S. Westerly breezes till the 27th, in lat. 7° S. lon. 2° E. it veered to S. S. Eastward. Made two tacks afterward, and arrived at St. Helena, 3d April.

Skelton Castle, Union in company, August 10th, 1803, in lat. 16° N. lon. 25½° W. lost N. E. trade, soon after had S. S. Westerly winds. Stood on the starboard tack, and crossed the equator on the meridian of London, Sept. 7th. Light S. S. Westerly winds continued: tacked at times to the westward. On the 24th reached lat. 9° S. lon. 9° E. The S. S. Westerly winds continued till the 28th, in lat. 11° S. lon. 4° E., it veered gradually to S. by E. and S. S. E.; stood on the larboard tack, and arrived Oct. 1st, at St. Helena: remained 3 days, and filled up the water.

Minerva, Lord Eldon in company, passed the Isle of Wight, June 18th, 1802; parted company, July 4th, in lat. 22° N. lon. 19° W., having passed to the westward of Palma. The Minerva passed to the eastward of the Cape Verd Islands, keeping in 19° W. longitude at the time. Lost N. E. trade 7th July, in lat. 13° N. lon. 19° 30′ W. Had westerly winds till the 12th, in lat. 7° N. long. 16° W. it veered to S. S. Westward; stood on the starboard tack, and crossed the equator, 25th July, in lon. 4° E. Continued on this tack with steady breezes, S. W. and S. S. W. till the 30th, in lat. 2° S. lon. 8° E.; had then calms, and variable breezes at southward. Tacked occasionally. In lat. 4° 20 S. lon. 8° E. Aug. 6th, the wind steady at S. S. W. and S. W. by S., stood S. Eastward till the 9th, in lat. 5° 22′ S. lon. 11° E. Tacked to westward; and on the 15th, in lat. 9° 30′ S. lon. 5° E. it veered to S. S. Eastward. Arrived at St. Helena the 20th.

Lord Eldon, after parting with the Minerva, July 4th, 1802, passed between St. Anthony and St. Vincent's; the channel appeared about 5 leagues wide, and very safe. She passed to the westward of the other islands, and lost the N. E. trade

July 11th, in lat. 11° 30′ N. lon. 23° W. S. W. and S. S. W. winds then commenced, stood on the starboard tack, and crossed the equator 30th, in lon. 4° 30′ E. Standing on S. Eastward, saw the land Aug. 3d, and thought it the Island Anno Bona, being in its latitude. Bore away to pass to leeward of it, had regular soundings from 13 to 10 fathoms; but the land opening as she stood to the northward, found it to be the main. By observations, of ☉ ☽ nearly agreeing with three chronometers, this part of the coast of Africa is in lat. 1° 37′ S. long. 9° 8′ E. From hence, with light S. W. and S. S. W. winds, tacked at times. August 24th, in lat. 9° S. long. 1° E, it veered gradually to south southeastward: stood on the larboard tack, and arrived at St. Helena on the 30th.*

Arniston, left the Isle of Wight, Jan. 2, 1802, and passed to the eastward of the Cape Verd Islands 20th, keeping in 19° W. longitude in passing. In lat. 7° N. long. 16° W. lost N. E. trade 24th, then calms and variable airs prevailed. On the equator, in long. 3° W. Feb. 15th, the wind commenced at southwestward, and continued from S. W. to S., with squalls at times, till in lat. 9° S. long. 1° E., March 5th it veered to south southeastward; stood S. W. and arrived at St. Helena 10th. From the equator, this ship tacked frequently, in proceeding southward, and was never more to the eastward than 6° E. longitude.

Earl Spencer, with six ships in company, for Bengal, July 28th, 1800, lost N. E. trade in lat. 16° 30′ N. long. 26° W.; had then light S. W. and S. S. W. breezes and calms. Stood mostly to southeastward, and crossed the equator, Aug. 26, in long. 2° E. The south southwesterly light winds continued, and veered gradually to S. and S. S. E. on Sept. 13th, in lat. 9° 40′ S. long. 13° E.; but did not get the steady southeasterly trade-wind till in lat. 13° S. long. 5° E., Sept. 23d.†

Georgina, August 18th, 1798, left the Isle of Wight, lost N. E trade Sept. 13th, in lat. 13° N. long. 18° W. On the 22d saw the coast of Africa, in lat. 5° N., and stood to the south-

* The Minerva made a more direct course from the Cape Verd Islands to the southward, than the Lord Eldon, and gained on her 10 days in the passage after separating, but the former had the advantage of superior sailing.

† Three of these ships, the Melville Castle, Skelton Castle, and Travers, separated from the others in the night of the 13th of Sept. stood to the west southwestward, and arrived at St. Helena 22d; filled up their water, sailed 29th, and arrived in Bengal river Jan. 1st, 1801, The Spencer, Walsingham, Herculean, and Tillicherry, arrived in that river, Jan. 2d, very short of water and other necessaries of life; their crews greatly debilitated by scurvy, having touched at no place during a six months' passage from the Lizard, from which they took a departure, July 2d, 1800.

The other three ships, by procuring a plentiful supply of water at St. Helena, prevented the scurvy; and reached Bengal river one day before their consorts.

eastward with southwesterly winds. Oct. 1st, at 8 A. M. the island St. Thomas bore W. by S. 8 leagues; from hence lay up S. by E. ½ half east, 84 miles, to 8 A. M. 2d, and made the long. 8° 14′ E. by ⊙ ☾. Variation 21° W. October 3d, latitude observed, 1° 09′ S. account 1° 10 S. long. 9° 07′ E. by ⊙ ☾ ✱, the coast of Africa extending from N. W. by W. to S. E., distant from shore 3 leagues, in 15 fathoms regular soundings. A heavy swell setting towards the land.

October 4th, with the wind variable at westward, lay up S. by W. and S. S. W. along the coast, in regular soundings from 14 to 23 fathoms, off shore 3 or 4 leagues. At noon, latitude observed, 1° 52′ S long. 9° 33′ by ⊙ ☾, distant from the shore 3 leagues. The extremes from N. E. by N. to S. E. ½ E. in 23 fathoms. No current.

Southwesterly winds continued till October 18th, in lat 8° S. lon. 7° 30 E., then gradually veered to S. by W. and S.; and shortly after to S. by E. and S. S. E., as she stood to the westward. Arrived at St. Helena 26th.

Glatton, passed Portland April 3d. 1799, and lost N. E. trade, May 4th, in lat. 6° N. long. 18° W. Had then light airs and calms; south southwesterly breezes followed, and continued at S. W. and S. S. W. June 3d, at noon, Prince's Island E. N. E. about 10 leagues, and three small islands from E. by N. to E. by S., the nearest, distant about 4 leagues. Latitude observed 1° 16′ N. long. 5° 53′ E. by chronometer.

June 5th, at noon, extremes of the island St. Thomas, N. W. ½ N. to S. S. W., off shore about 9 miles. Latitude observed, 00° 20′ N. Saw a ship and 2 brigs at anchor in shore.

June 6th, south southwesterly winds, working to windward to pass on the east side of the island; kept the lead going in standing towards it after dark, had 24 fathoms, tacked, and struck on a shoal in stays; hove all aback, and got off without damage. Finding a strong westerly current, bore away to leeward of the island. At midnight it bore from S. E. by E. to S. W. by W.: at daylight from S. E. to S. S. W., distant 4 leagues: at noon, S. ½ E. to E. S. E. latitude observed 00° 15′ N. South southwesterly winds continued. June 9th, saw at 6 A. M. very low land from E. ½ S. to S. E. by E., stood E. S. E. ½ S. 8 miles, had ground 52 fathoms mud and tacked. At noon lat. observed, 00° 33′ S. long. 8° 40′ E. by chronometer, the land bearing E. seen from mast-head.

June 10th, at sunset, in 27 and 28 fathoms, the southern extreme of the land S. by E. ½ E. Variable winds and a strong northerly current. June 12th, lat. observed, 00° 4′ S. long. 8° 15′ E. South southwesterly winds; found the current set W. by S. ½ S. 1½ mile per hour. June 13th, at day-light, the land of Cape Lopez from S. S. E. to E. S. E. no ground 40 fa-

thoms. Stood W. 10 miles to noon. Lat. observed, 00° 42′ S. long. 8° 22′ E. by chronometer. Variation per azimuth, 25° W. The south southwesterly winds continued till 27th, in lat. 7° 20′ S. long. 5° E. they veered to the S. and S. S. E. stood to the S. W., and arrived at St. Helena 5th July.

Georgina, left the Lizard, Feb. 25th, 1796, and lost N. E. trade, March 18th, in lat. 10° N. long. 18° W. She had then variable light winds, southwesterly and northerly currents to the equator, crossed it April 15th, in long. 3° E. April 16th, a brisk N. N. W. breeze placed her in lat. 1° 25′ S. The south southwesterly winds returned, and continued between S. S. W. and S. by E., till the 15th, in lat. 5° 26′ S. long. 3° E. She tacked to the southwestward, and on this tack, with S. S. E, and S. E. winds, arrived at St. Helena, 2d of May.

Carnatic and fleet, bound to China, left the Lizard, Aug. 26th, 1796. Lost N. E. trade Sept. 5th, in lat. 11° N. long. 23° W. Stood to the S. E. with south southwesterly winds, and crossed the equator, Sept. 19th, in long. 5° W.: the same winds continued. On the 2d Oct. at noon, observed in lat. 8° 52′ S. long. 11° 40′ E. The wind veered to S. by W. Oct. 9th, in lat. 11° S. long. 8° E. stood to the westward. On the 15th, in lat. 16° 14′ S. long. 00° 30′ W. bore away for St. Helena, to fill up their water, and anchored 17th.

Queen, parted with Carnatic and fleet, Sept. 16th, in lat. 2° 30′ N. long. 9° W. At noon the 25th, lat. observed 1° 31′ S. long. 5° 16′ E. by chronometer, the island Anno Bona bearing from E. by N. to E. by S. distant 4 or 5 leagues. Tacked at this time, there being an appearance of shoal water, and low land projecting out from the island. Had mostly southwesterly winds from losing the N. E. trade, veering at times to southward; these continued till Oct. 9, in lat. 8° S. long. 3° E., then veered to S. by E. and S. S. E. Arrived at St. Helena 16th.

Swallow, left the Lizard Point, Jan. 3d, 1795. Lost N. E. trade 29th, in lat. 10½° N. long. 18° W. After passing in sight of the Canary Islands, to the westward, had constant N. W. and westerly winds, which obliged her to pass to the eastward of Cape Verd Islands. The southwesterly winds commenced when she lost the N. E. trade, but frequently inclined to vary several points. Crossed the equator, Feb. 13th, in long. 8° W. On the 24th, in lat. 4° S. long. 2° 30′ E. the wind veered to S. by E. From hence she stood mostly to the S. W. till March 8th, in lat. 18° 30′ S. long. 8° W., made then several tacks, and arrived 14th at St. Helena.

Duke of Buccleugh, left Porto Praya, April 18th, 1794, and lost N. E. trade 20th, in lat. 11° 30′ N. long. 19 W., then had northwesterly and faint variable airs till May 6th, in lat.

5° 30′ N. saw the African Coast bearing from E. by S. to N. E. by N. distant 6 or 7 leagues in 55 fathoms green ouze. Had now southwesterly and southerly light breezes, and saw the land daily till the 10th, in lat. 5° N.: the current set to the northward: with southwesterly light winds crossed the equator 28th, and saw the Island Anno Bona, 31st. Was baffled near this island several days by southerly winds. June 3d, latitude observed, 1° 19′ S., Anno Bona from S. 24° E. to S. 50° E. A white rock to the southward, S. 18° E., and a small isle to the northward S. 53° E., distance from the shore 5 or 6 miles. June 4th, at noon, latitude observed 1° 19′ S. Anna Bona, W. ¼ N. 5 or 6 leagues. Variation, 18½° W. In lat. 3° 30′ S. tacked to S. W. with the wind at S. and S. by E., and reached St. Helena 19th, without tacking.

Nancy, Dec. 30th, 1793, left the Lizard. Passed to the eastward of the Cape Verd Islands, Jan. 18th, 1794. Lost N. E. trade 21st, in lat. 10° 30′ N., and had ground 63 fathoms same time, on the African Coast: had now light N. W. winds. In lat. 6° N. saw the land, in 40 fathoms. Jan. 31st, passed Cape Palmas at 7 miles distance, the wind now veered to S. W. The variation 19½° W. With S. W. winds crossed the equator, Feb. 6th, but at times it veered to westward. In lat. 6° S. Feb. 13th, the wind S. S. W. and S by W. Tacked to the westward. It veered to S. S. Eastward, in lat. 8° S. on the 17th. Arrived at St. Helena 28th, without tacking.

Royal Charlotte, left the start, Dec. 30th, 1792-3, Jan. 28th, passed over the Porgas Bank as placed in the charts; kept the lead going but got no bottom. The rigging is covered with brownish dust, and the clouds come from southwestward in opposition to the trade wind. Lost N. E. trade, Feb. 1st, in lat. 8° 30′ N. long. 16° 12′ W. Had now northwesterly and light variable breezes. At 2 P. M. the 8th, saw the Grain Coast, N. E. ¼ N. At 4 P. M. extremes from N. N. E. to E., distant 5 leagues in 36 fathoms. At noon, latitude observed, 4° 53′ N. long. 9° W. by chronometers, extremes of the coast from N. to E. ¼ S., vessels at anchor in Settra Krow Road, N. E. by E., off shore 4 leagues in 40 fathoms. The current has set southeasterly these last 6 days. From hence steered S. E. 11 miles to 6 P. M. 9th, the coast then from N. W. ¾ W. to E. S. E., a vessel at anchor off a rocky point, with breakers, like the entrance of a river, N. E. ¼ E. off shore 4 leagues, in 36 fathoms. The weather is hazy, and the coast very low. At noon, latitude observed, 4° 36′ N. long. 8° 25′ W. by chronometers, Niffou N. 1° E., Village Little Sesters N. 60° E., off shore 3 leagues in 37 fathoms. Variation 17° W. Being nearly calm in the night, drifted into 17 and 15 fathoms sand, heard the surf on

the shore and prepared to anchor; but a land breeze commenced at 3 A. M., stood out S. S. W. and soon deepened.

Feb. 10th, John George, master of the Brig Queen Charlotte, came on board. He is an experienced coaster, and advises falling in with the land about Cape Palmas, and by no means to the westward of it; as the land winds are generally very faint, and should the sea winds prove scant, a ship will receive little benefit from it; there is also a constant indraught which sets towards the shore; which we experienced last night. He says Cape Palmas should not be rounded nearer than 28 fathoms: it is very woody, and from this depth no appearance of a town is perceived on it. The coast from Cape Palmas to Cape Three Points is clear of danger, and the anchorage good. At 6 P. M. the town Grand Sesters, N. N. E. ½ E., distant about 3 miles in 30 fathoms. The chronometers make it in long. 8° 11′ W., the lat. 4° 39′ N. by noon observation.

Feb. 11th, by observations at noon, make Cape Palmas, in lat. 4° 30′ N. long. 7° 41′ W. by chronometers. Departed from Cape Palmas, Feb. 12th, had southwesterly winds and northeasterly currents till the 16th, the latter abated in strength, and set to the westward of N. for 3 days. On the 21st, with the S. W. winds, passed to the eastward of St. Thomas. The chronometers made the N. end of this island in long. 6° 37′ E.: had still northerly currents. Feb. 24th, spoke the Margery of Liverpool; Thomas Oliver, master, says Cape Lopez is low, and extends farther out than placed in the charts. It makes in a low point, and is seen before the back land. All the coast is rather low, but clear up to Angola, and may with safety be borrowed on in the night to 15 fathoms. Feb. 25th, in lat. 2° 7′ S. long. 9° E. by chronometers, had ground 45 fathoms, and saw the appearance of land. March 3d, in lat. 5° 40′ S. long. 9° E. Tacked to westward; the southwesterly winds continued 4 days, veering to southward on the 8th and 9th, in lat. 11° S. On the 11th, in lat. 13° S. it veered to S. by E. and S. S. E. Anchored 13th at St. Helena.

Valentine, left the Isle of Wight March 9th, 1792, and passed on the east side of Palma, and to the westward of Ferro the 20th. On the 25th and 26th kept in long. 19° to 19½° W. in passing to the eastward of Cape de Verd Islands. Lost the northerly winds the 31st, in lat. 7° 30′ N. long. 14½° W.; had then calms and light southwesterly breezes. Crossed the equator April 25th, in long. 1° 30′ E. From lat. 4° N. to 2° N. the current set eastward. From the equator the wind was mostly from S. S. W. and S. by W. veering to S. by E. and S. S. E. at times. Worked to the southward till May 3d, in lat. 4° S. long. 5° 30′ E. then with a S. S. E. wind stood to southwestward, and arrived 11th, at St. Helena.

OCEAN, Dec. 20th, 1791, left the Start Point: Jan. 11th lost N. E. trade, in lat. 8° 40′ N. long. 17° W. From hence had light variable winds all round, and calms, with sontheasterly currents at times, and during two nights much thunder and lightning. On the 20th, saw the land; at noon the extremes from Cape Mensurado N. 58° E. to N. 81° E. distance off the Cape about 9 leagues. No ground 120 fathoms. Latitude observed, 6° 7′ N. long. 11° W. by chronometer, and 10° 50′ W. by ☉ ☽, which mean will place the cape in long. 10° 35′ W., and in lat. about 6° 27′ N. from its bearing at noon. Saw yesterday several drifts and sea-weed, but no birds of any kind. Jan. 21st, the mean of observations ☉ ☽ and chronometer this day, makes Cape Mensurado in long. 10° 36′ W. At midnight had ground 47 to 50 fathoms. At noon, the land in sight from top E. N. E. latitude observed 5° 24′ N., long. 10° W., by mean ☉ ☽ and chronometer. No ground 90 fathoms. Steered S. S. E. ¼ E. 46 miles to 4 A. M., and had ground 48 fathoms. From the course steered, did not expect to be so near land. For some days past, the wind has been mostly westerly and N. W., it now inclines from S. W. Jan. 24th, mostly calm, but at 10 A. M. a tornado squall blew strong for a short time, with thunder, lightning, and rain. Faint southwesterly breezes, and generally N. E. currents prevailed, till in lat. 2° N. long. 5° W. 30th, the latter began to set northwestward, and light breezes continued mostly from S. S. W. to S. Crossed the equator, Feb. 9th, in long. 1° E. and had now a weak current to westward. In lat. 5° 40′ S. long. 6° 30′ E. the 18th, the wind veered to S. and S. by E., tacked to southwestward, and with a S. S. E. trade, most of the way, arrived 28th at St. Helena.

2d Western Passage.

ARNISTON and fleet, lost N. E. trade April 27th, 1795, in lat. 4° N. long. 18° W., had S. W. and S. S. W. winds till May 5th, in lat. 1° S. long. 15° W., and got the S. E. trade next day. She parted with the fleet, and was never more westward than long. 25° W., nor to the southward of lat. 25° S., and arrived June 2d, at St. Helena.

DART, Sept. 26th, 1794, got westerly and S. W. winds in lat. 9° N. long. 21° W.; these continued till Oct. 6th, in lat. 1° N. long. 13° W., then veered to S. S. E., stood to the southwestward. In lat. 20° S. long. 16° W. tacked to eastward on the 21st; in lat. 14° S. long. 10° W. tacked to southward, in lat. 17° S. long. 10° 30′ W. tacked to eastward the 28th; afterward, made various tacks between 15° and 19° S. lat. and reached St. Helena Nov. 8th, having never been more westward than 16° 50′ west longitude during the passage from the equator to the island.

MARQUIS OF ELY, left the Isle of Wight, Feb. 13th, 1802, lost N. E. trade March 12th, in lat. 4° N. long. 22° W., and got S. E. trade 21st, in lat. 2° S. long. 24° W. In standing across the trade she did not get to the westward of 29° W. long. On the 4th April, her most southerly position was in lat. 29° S. long. 21° W. She arrived the 19th, at St. Helena.

PRINCESS MARY, left the Lizard Sept. 12th, 1801, with a fleet, and lost the N. E. trade October 9th, in lat 21° N. long. 26° W.; separated from the fleet and got the S. E. trade 30th, in lat. 1° S. long. 19° W.; lost S. E. trade Nov. 9th, in lat. 18° S. long. 25° W., had then light variable easterly winds till in lat 31° S. long. 11° W. on the 21st, then northeast and northerly winds. In lat. 32° S. long. 9° W. on the 25th, stood northward, and arrived Dec. 2d, at St. Helena.

HUGH INGLIS, with a fleet, left the start, May 4th, 1800; lost N. E. trade June 1st, in lat. 10° N. long. 25° W. and got the S. E. trade 16th, in lat. 2° N. long. 28° W. Separated with the fleet, went as far as lat. 33° S. and arrived August 14th, at St. Helena.

ARNISTON, left Portland Jan. 8th, 1800, lost N. E. trade Feb. 13th, in lat. 6° N. long. 21° W. and got S. E. trade 27th, in lat. 1° N. long. 21° W. She went to lat. 29° S. and arrived April 4th, at St. Helena.

PRINCESS MARY, left Portland Nov. 19th, 1799, lost N. E. trade Dec. 13th, in lat. 6° N. long. 21° 30′ W., and got S. E. trade 17th, in lat. 4° N. long. 22° W. Between 27° and 31° S. lat. had calms and light winds, did not exceed lat. 31° S., and arrived Jan. 29th, 1800, at St. Helena.

LORD HAWKESBURY, left Portland, April 25th, 1799, lost N. E. trade May 19th, in lat. 7° 30′ N. long. 18° W.; on the 30th was in lat. 5° N. long. 5° 30′ W., and got S. E. trade June 9th, on the equator, in long. 14 W.; July 25th, in lat. 31° 50′ S. long. 10 W., had calms and light airs several days, then stood to the northeastward with variable breezes till in the S. E. trade, and arrived August 10th at St. Helena.

TELLICHERRY, June 11th, 1798, left the Lizard; lost N. E. trade 30th, in lat. 12° N. long. 26° W., and got S. E. trade July 10th, in lat. 3° N. long. 24° W.; on August 8th, her most southerly position was lat. 30° S. long. 22° W., and arrived 18th at St. Helena.

CANTON, left the Lizard April 15th, 1796; lost N. E. trade May 7th, in lat. 13° N. long. 19° 30′ W., having passed to the eastward of Cape Verd Islands; got S. E. trade 23d, in lat. 0° 30′ S. long. 24° W. For three days previous to crossing the equator had strong westerly currents; on it they changed, and set strong to N. E. three days. In lat. 25° S. long. 21° W.

June 11th, with westerly winds steered east; in lat. 23° S. long 11° W. on the 15th, got easterly winds, then variable at N. E. and northward till in lat 21° S. long. 7° W. on the 20th, the S. E. trade returned, and arrived the 23d at St. Helena.

Ceres, bound to St. Helena, crossed the equator the 7th May 1815, in long. 20° 20′ W. (having lost N. E. trade in lat. 5° N. long 19° W., and got the S. E. trade in lat. 0° 40′ S.) She lay up well to the southward, and went not farther west than long 25°, when in lat. 19° 20′ S. on the 15th. Here the winds veered to East and N. E. with which she stood to S. E. and E. S. E., the winds drawing to N. N. W., and W. as she ran to the eastward. On the 23d, she was in lat. 22° 15′ S. long. 10° W., and was never farther south; from hence she steered E. N. E. to long. 7½° W. with W. N. W. and W. winds, then steered N. N. E.; got the S. E. trade wind again in lat. 19° S. nearly on the meridian of St. Helena, where she arrived on the 28th, having 21 days passage from the equator.

Herefordshire, bound to St. Helena, crossed the equator the same day as the Ceres, on the 7th May, 1815, in long. 22° 7′ W., and on the 15th was in lat. 17° 15′ S. long. 27° 25′ W., being her farthest westerly position; with northeast and northerly, and S. S. E. winds, she steered first S. E., then E. nearly on the parallel of 20° S. lat. till in long. 15° W. on the 24th. Here she got a return of the S. E. trade-wind, and steered to the southward and S. S. E. till in lat. 28° 30′ S. long. 11° W. on the 1st June, from whence she steered E. N. E. to long. 7½° W. with northerly winds, then N. N. E., and got the S. E. trade again in lat. 26° S. and arrived at St. Helena 8th, having a passage of 32 days from the equator, or 11 days longer than the Ceres.

3d. *Comparative view of passages to and from St. Helena.*

By these examples of ships which have gone by the eastern and western routes to St. Helena, combined with other information, it appears that the eastern route may be adopted in November, December, January, February, and March. If a ship bound to St. Helena, cross the equator in any of these months, and find the winds incline from southwestward, by standing to the S. E. across the gulph of Guinea close on a wind, and afterward tacking as it veers to the east or west of S. she will most probably reach St. Helena in less time than if she had proceeded by the western route. From the time of losing the N. E. trade, 40 or 44 days to St. Helena may be considered a medium passage by the eastern route in these months, although the Swallow made it in 31 days. From the southern limit of the N. E. trade, the passage by the western route is seldom ac-

complished in less than 40 days. By this route, 43 days seems about the medium passage; and during any month of the year it may be made in this time, from the situation mentioned. The Arniston made it in 36 days in May, &c. but she did not go more south than 25° S. latitude, and the Ceres made it in 21 days from the equator, not going beyond lat. 22° 15′ S. When the sun has great north declination, the eastern route seems precarious; the other seems most certain at all times. A ship that sails indifferently close hauled or in light winds, should not attempt the eastern route in this season; but one that slides fast through the water in faint breezes, and holds a good wind, may probably proceed by the eastern route in any season with safety. The Britannia's passage of 95 days in the favourable season, from the southern limit of the N. E. trade to St. Helena, by the eastern route, is a singular case. It has been the practice with ships going the western route, to run far south, sometimes to lat. 32° and 33° S.; this can seldom be requisite, as it lengthens the passage; the ships which have not proceeded so far south, have generally made the best passages to St. Helena.*

From St. Helena to England, the passage with a fleet is generally about two months, or seven weeks in a single ship that sails well.

From this island to the Cape of Good Hope, the passage is about a month. The Georgina was 26 days in making it in November, 1798; in February, 1799, she was 28 days; and in April and May, 32 days completing the same passage.

From Cape Good Hope to St. Helena, the passage may be estimated at 13 days; it is frequently performed in 10, and has been accomplished in 8 or 9 days.

The Georgina departed from St. Helena Sept. 18th, 1806, and carried the trade and northeasterly winds to lat. 30° S. long. 49° W. On the 13th Oct. she entered the River Plate, and grounded on the banks, nearly in sight of Buenos Ayres on the 19th, but soon got off without damage, the bank being soft mud where she grounded. She got clear of the River Plate on the 21st Oct. and arrived at Table Bay, Cape Good Hope, Nov. 24th, and gave intelligence of the recapture of Buenos Ayres.

GEORGINA, left St. Helena, May 22d, 1805. In lat 27° S. and long. 6° W. the 30th, got the wind at northward and N. E. three days, and then steered E. by S. June 2d, in lat. 26° S. long. 3° E. it veered to W. S. W. and S. W., and continued till in lat. 20° S. long. 9° E. the 6th: it then veered to the southeastward. June 9th, at 7 P. M. heard the surf, and saw break-

* In these times of scientific improvements, it is not necessary to adhere implicitly to instructions given half a century since; for coppered ships which sail well upon a wind, with good chronometers and other instruments on board, may often accelerate their voyage by deviating from ancient precepts.

ers on the lee beam, hauled off N. E.; shortly after saw the land bearing S. S. E. and sounded in 38 fathoms, sand. At day-light the land from S. ½ E. to E. S. E., off shore 5 leagues, in 52 fathoms. At noon the high land from N. E. by E. to S. S. S. W., a remarkable hill like a Turk's cap, which we suppose to be Mount Negro, E. S. E., off shore 7 or 8 miles, in 45 fathoms, sand, coral, and shells. Lat. observed 15° 30′ S., long. by ☉ ☽ 12° 28′ E. June 10th, steered along shore, mostly N. E. and N. E. by E. with light westerly winds and hazy weather. At sunset the coast from S. W. by S. to N. by E., off shore 6 or 7 miles; shortly after had 19 fathoms mud, steering N. E. by E. At 10 A. M. Tyger's Bay S. S. E. ½ E. and a large bay open S. by E. off shore 7 or 8 miles.

June 11th, light winds from S. W. to W. and cloudy weather; at sunset a bluff point S. E. by S.; a remarkable high round hill S. by E., off shore about 7 miles; at noon, lat. observed 13° 07′ S., account 13° 8′ S. June 12th, light westerly winds and fine weather, hove to in the night; at 8 A. M. St. Philip's Bonnet E. by S. ½ S. 3 or 4 leagues; at noon lat. observed 12° 33′ S., St. Philip's Point S. E. ¼ E. 2 leagues, the extremes of the land from E. N. E. to W. S. W. ½ S., off shore about 4 miles; P. M. steered S. E. by E. into the bay; at 3 the master attendant came on board, and at 4 anchored and moored in Benguela Bay in 10 fathoms, with the best bower to seaward.

The Georgina received 84 bullocks, sailed June 21st, and had light winds from westward near the land; stood to the westward on the 22d, with a fresh breeze at S. W.; it continued at S. W. by S. and S. S. W. till in lat. 13° S. on the 26th, veered then to S. by W. and to S. on the following day. June 28th, in lat. 15° 30′ S. long. 2° 30′ W. it veered to S. by E.; arrived the 29th at St. Helena.

Georgina, Sept. 15th, 1805, left St. Helena. In lat. 21° S. with southerly and light variable winds the 18th, stood east northeastward; in lat. 12° S. long. 7° E. on the 29th they veered to S. and S. S. W. moderate and light breezes, which continued till she arrived, Oct. 4th at Benguela.

Sailed from hence the 22d, had the wind mostly at W. and W. S. W. (often variable) till in lat. 10° 30′ S. long. 7 30°′ E. the 26th; it now veered to S. W., next day to S. S. W. and S. fresh breezes and squally. From the 26th to the 30th it blew strong from S. by W. to S. by E.; afterwards it continued steady at S. by E., arrived at S. Helena Nov. 1st, having experienced a confused head sea great part of the passage.

Winds and Currents in the Gulf of Guinea: Coasts, and adjacent Islands, and from thence to the Southward.

ALONG the coast of Sierra Leone and the Grain Coast, to Cape Palmas, N. W. and N. N. W. winds mostly prevail. From this cape, across the Gulf of Guinea to Cape Lopez, they are found to prevail in general from S. W. and southward. The currents are variable on the Grain Coast; in the S W. monsoon, when the sun is far to the northward, they frequently run to the N. W. but at other times often to the S. E. They set mostly between north and east across the gulf from Cape Palmas to Cape Lopez, particularly from the Coast to lat. 2° N. From lat. 2° N. across the equator, to lat. 1° or 2° S., the current frequently sets strong to the westward; this is mostly experienced about the equator, and a little to the northward of it, when the sun has great north declination.

Although in the Gulf of Guinea, the winds blow generally from southward and S. S. W. towards the coast in S. latitude, they are observed near the land to take a more westerly direction; often prevailing from S. W. and W. S. W. along the African coast between Cape Lopez and Benguela. As the distance is increased from the coast, the winds veer in proportion more southerly; it has been said, that the boundary of the winds which blow from S. to S. W. along the west coast of Africa to lat. 28° S. is an imaginary line drawn from Cape Good Hope to Cape Palmas. It may be observed, that the winds are found in general to draw to the S. by E. or S. S. E. considerably to the eastward of this imaginary line; some ships, however, have been perplexed with the winds from S. and S. by W. between 7° and 15° south lat. until several degrees to the westward of this imaginary line; although this seldom happens.

From Cape Lopez to Sierra Leone a dry parching easterly wind sometimes blows along the coast of Guinea, in December, January, and February, and is called the Harmattan by the Fantees, a nation on the Gold Coast. In these months, the Harmattan may come at any period of the moon, and it continues sometimes only one or two days, sometimes five or six, and it has been known to last fifteen or sixteen days. There are generally three or four returns of it every season, and it blows moderately. On the coast of Sierra Leone, its direction is from E. S. E., and the same farther northward On the Gold Coast from N. E., and at Cape Lopez and the river Gabon from N. N. E, The Harmattan is accompanied by a dark

haze; and it is a cold parching wind, destructive to vegetation, but purifies the atmosphere from infectious exhalations.

The rains set in on the Coast of Guinea in May, and continue till October; as they do also on the west coasts of both peninsulas in India, and others situated to the northward of the equator, which have the ocean open to the west or southwestward. Preceding and subsequent to the rainy season, on the Coast of Guinea, tornadoes may be expected; these are hard squalls from east and east southeastward, accompanied with thunder, lightning, and much rain. In the Gulf of Guinea, faint breezes and calms are also frequent at various seasons of the year.

About Cape Lopez, and from thence along the coast to the southward, the current often sets to the northward; at other times it is variable, with strong ripplings, near the rivers in the rainy season; when the freshes from these rivers, added to a body of water being driven towards the coast by the S. W. wind, is turned backward and forms a westerly current. In the dry season, there is frequently no current.

The rainy season to the southward of the equator, on the Coast of Loango, Congo, and Angola, is the opposite to that on the Coast of Guinea; the sun in the northern hemisphere bringing the rainy season on the latter coast, at which time it is the dry season of the former; the southern sun producing the rains to the southward of the equator.

In the fair season, on the coasts which embrace the Gulf of Guinea, land and sea breezes prevail; but the winds blow almost constantly from the sea during the rains.

Headlands or Islands, from Cape Verd around the coast of Guinea, are sometimes seen by East India ships, proceeding by the eastern route to St. Helena, the chief of which appear to be situated by lunar observations and chronometers as follows.

Cape Verd, in lat. 14° 50′ N. long. 17° 35′ W.

Cape Roxo, is in lat. 12° 12′ N. long. 16° 50′ W.; and 18 leagues to the south southeastward, lies the Bissagos Islands encircled by shoals, with other shoals between them and Cape Roxo.

St. Ann's Shoals, front the coast to the S. W. of Sierra Leon at a great distance, and their western extremity in lat. 7° 34′ N. long. 13° 28′ W., bears nearly south from the Isles de Loss.

Cape St. Anne, the western extreme of Sherbro Island, is situated in lat. 7° 5′ N. long. 12° 20′ W., and a group called Turtle Isles project from it to the westward, uniting with the southern extremity of the foregoing shoals.

Cape Mensurado, in lat. 6° 25′ N. long. 10° 30′ W. is high;

and from Cape Verd to this part of the coast of Guinea, soundings extend out to a considerable distance from the land.

Cape Palmas, in lat. 4° 30′ N. long. 7° 41′ W. is rather low, like most parts of the coast of Guinea, and it should not be rounded under 28 fathoms. Variation 17° W. in 1793.

Cape Three Points, is in lat. 4° 31′ N. long. 2° 41′ W.; and Cape St. Paul, the western extremity of the Bight of Benin, in lat. 5° 29′ N. long. 0° 50′ E.

Cape Formosa, in lat. 4° 5′ N. long. 5° 5′ E. is very low, forming the eastern extremity of the Bight of Benin, and from hence the coast extends about 53 leagues nearly east to the north of Calabar River, all low land, where it turns round to the southward, forming the Bight of Biafra, into which flow several large rivers.

Island Fernando Po, situated in the middle of the Bight of Biafra, is about 13 or 14 leagues west of the mouth of the great River Camaroons, the body of it being in lat. 3° 14′ N. long. 7° 48′ E., and it is about 20 leagues in circuit, inhabited by negroes, well watered, abounding in sugar-cane and fruits.

Prince's Island, in lat. 1° 30′ N. long. 7° 3′ E., is about 27 leagues to the W. N. W. of Cape St. John, and about the same distance to the S. S. W. of Fernando Po. It is high, with a village and harbour on the east side, where bullocks, hogs, goats, and water may be procured. There are some rocks and islets adjoining, particularly those called the Three Brothers, about 4 or 5 leagues to the S. W., and that called Caroco, about 2 leagues to the southward.

Island St. Thomas, about 40 leagues west of Gabon River, is about 26 leagues in circuit, of a round form, its north extremity being in lat. 0° 30′ N. long. 6° 37′ E., and the islets off its south extremity lie on the equator. This island belongs to the Portuguese, and it affords some articles of refreshment for ships that touch at the bays on the eastern part, the chief of which is Anna de Chaves; but the shore to the northward of this bay being rocky and steep, it must have a wide birth in passing.

The Chesterfield, working toward the road of St. Thomas, on the 18th of September 1781, with the Blandford and Tartar in company, got no ground at 50 and 60 fathoms, until the rocks were seen along side, had then 16 fathoms and the ship grounded in stays. When aground, the fort bore S. W. by S., a small island off the northwest point of the road N. W., the eastern extreme S. by W., off shore about 4 or 5 miles, and off the small island nearly 3 miles. Hove the ship off the shoal with the stream anchor, and the assistance of a schooner: afterward, steered for the road, keeping the fort from W. to W. by S.;

had from no ground 60 to 16 fathoms, and shortly after 6 fathoms, shells, sand, and coral, then anchored with the small island bearing N. by W. ½ W., south end of St. Thomas S. ½ W., the northernmost point N. W. ½ W., and the fort W. S. W., off shore about 2 miles. The Tartar anchored in 5½ fathoms, with the fort S. W. by W. distant 1 mile, and the Blandford much farther out; by observation, they made the south end of the island to lie on the equator.

There are two large bays fit for large ships, with a small bay between them, and the principal one where the fort is, lies at the S. E. part of the island; in this bay, the depths are from 8½ to 4 fathoms close in shore, the bottom clear fine sand. The other large one, called Man of War Bay, has a few huts, with good anchoring ground, and is situated at the northwest part of the island.

To approach the bay where the fort is situated, the best way is to come round by the south end of the island, because the current sets mostly to the northward, and the winds prevail from southward. The shore to the southward of the fort can be approached with greater safety than to the northward, but not under the distance of 1½ mile until the fort is brought to bear W. by N.

The lead is no guide in turning in from the northward, because from no ground, a ship may have 12 fathoms, and be aground before another cast of the lead can be hove.*

Anno Bona, in lat. 1° 30′ S. long. 5° 48′ E. (the body) distant 56 leagues westward from Cape Lopez, is 7 or 8 leagues in circuit, rising in 2 high hills, the summits of which are often clouded, and on one of them is said to be a lake of pure water. This island is refreshed by constant breezes, which render it healthy; it abounds with tropical fruits, domestic animals, poultry, and produces excellent cotton; the inhabitants are negroes, converted to the catholic faith by the Portuguese. The best anchorage is the N. E. part of the island, where there is a village: on the west side, the appearance of shoal water was seen by the Queen in passing, projecting from some low land. Variation 19° W. in 1794.

Cape Lopez Gonzalves, in lat. 1° 11′ S. long. 8° 40′ E., is low and woody, and with the whole of the coast, which is generally low to Angola, may be approached to 15 or 20 fathoms.

Loango Bay, in lat. 4° 38′ S. long. 11° 27′ E. is surrounded by red cliffs; and from the southern extremity called Indian Point, a reef projects nearly half way across the bay, with good

* The Glatton struck on a shoal here, as will be seen under that ship's name among the descriptions of eastern passages to St. Helena.

anchorage within it in 4 fathoms, three quarters of a mile from the shore; but the surf prevents landing, except in the canoes of the country.

Congo River's Mouth, in lat. about 6° 0′ S. is wide, with rapid freshes running out of it to the northwestward, which discolour the sea at a considerable distance, and carry floating islands of trees a great way out to sea, but being seldom visited by ships, this river is not well known.*

St. Paul de Loando, in lat. about 9° 0′ S. situated on the south shore of Bengo Bay, and on an island 10 leagues long, which with the peninsula of the main, forms a good port: this is the chief settlement of the Portuguese on the coast of Angola.

Benguela Bay, in lat. 12° 39′ S. long. 13° 29′ E. or 19° 5¼′ east of James's Town, St. Helena, by Capt. Heywood's chronometers, in H. M. ship Nereus, is called also the Bay of St. Antonio, St. Philip of Benguela, being the chief Portuguese settlement on this coast.

The Nereus, on the 29th Jan. 1811, anchored in 10 fathoms, with the flagstaff just touching the east side of the church, bearing S. 54° E. distant 1¼ mile.

The Georgina 12th June 1805, moored in 10 fathoms, with the northern extreme of the land N. by W. ½ W., St. Philip's Bonnet W. N. W. ¼ W., the flagstaff of the Fort S. E. ¼ E., off shore 1½ mile, and found 2 ships and 7 brigs in the Road, under Portuguese colours.

This bay is formed on the S. W. side by a peninsula, the extremity of which is called Punta de Chapeo, from a single clump of trees on it, the shore on each side being barren; and this clump is called St. Philip's Bonnet or Hat. The extreme points of the bay, extend from each other about 7 or 8 miles; and from a transit line joining these points, the bay is about 2½ miles in depth to the beach: upon that transit line, and half way between St. Philip's Bonnet and the low sandy point of the bay, the depth of water is 17 fathoms, from hence, decreasing gradually to 6 fathoms within a mile of the shore.

The surrounding country abounds with excellent fruit and vegetables, but the water is not of the best quality, and procured with some difficulty, by bailing it out of wells of considerable depth, distant about 300 yards from the beach. The Nereus was well supplied with bullocks, sheep, goats, hogs, fruit

* The freshes run constantly out of the Congo or Zahir River all the year, sometimes at the rate of 6 and 7 miles an hour, there being no tides; and as there is upward of 100 fathoms water in the middle of the entrance, the difficulty of navigating it is great, and its extent and source at present are enveloped from the knowledge of Europeans. But it is to be hoped, our knowledge of this great river will soon be enlarged, by the exertions and talents of the officers, lately sent by Government to explore it.

and vegetables; and plenty of fine fish were caught by the seine in the bay. Variation 20° W. in 1806.

Cape Negro, in lat. 16° 0′ S. long. 11° 54′ E. by chronometers, measured from Benguela, is the westernmost land of this part of the coast, of a level, brown, sandy appearance, discernible at 7 leagues distance, were it not for the atmosphere being generally hazy; but in passing at 3 leagues distance, in regular depths of 12 to 15 fathoms, no projecting headland was seen in the Nereus.

Between Benguela Bay and Cape Negro, there are several bays near the former; and Village Bay, Turtle Bay, and Little Fish Bay, nearest the Cape. Village Bay is in lat. 14° 10′ S. where the Abington and Josiah anchored in 20 fathoms, in Oct. 1703, and got plenty of wood, and water from a pool near the shore.

Port Alexander, in lat. 15° 52′ S. is formed by the peninsula of Cape Negro, which terminates in a curve to northeastward, bounding the entrance on the west side. This Port has from 12 to 20 fathoms water in it, and seems to be well sheltered from all winds, by the sketch of it made in H. M. sloop Star, in 1796.

Fish Bay, in lat. 16° 30′ S. formed by a narrow sandy peninsula on the west side, called Tiger Peninsula, has even soundings from 12 to 6 fathoms, being a spacious and safe harbour. But as there is said to be no fresh water on the coast, from lat. 16° to 31° S., these bays are seldom visited, except by whalers.

Walvish Bay, in lat. 22° 54′ S. long. 14° 36′ E. is spacious and well sheltered, except from northerly winds, which seldom blow here; and it is frequented by whalers. Soundings extend a considerable way off the coast, from hence to Cape Negro.

Sandwich Harbour, in lat. 23° 30′ S. is small, with only 3 fathoms water in it.

Spencer's Bay, in lat. 25° 46′ S. has 5 and 6 fathoms water, but although sheltered by Mercury Island on the west side of the entrance, it is rather exposed to northerly winds.

Angra Pequena (Little Bay) or Santa Cruz, in lat. 26° 37′ S. has 3½, 4, and 5 fathoms water; and the best and deepest anchorage, is on the east side of the Isles at its entrance, in 4 or 4½ fathoms, sheltered from all winds.

Elizabeth Bay, in lat. 27° 0′ S. long. 15° 37′ E. is formed by Possession Island, which lies about 3 miles from the land, having a channel between them of 8, 9, and 10 fathoms. A ship may anchor under the island, and be sheltered from W. to S. W. Var. 22° 50′ W. in 1793. This place is the boundary between the Kaffer and Hottentot Countries.

Cape Voltas, in lat. about 28° 42′ S. long. 16° 20′ E. is

the south point of the Orange or Giarep River; an extensive shoal projects from it, and to the south adjoining to the coast, there are several islets.

To the southward of Cape Voltas, soundings seem to extend far out, for the Hanover from India, on the 2d June 1715, in lat. 29° S. perceiving the water discoloured, sounded in 95 fathoms fine sand, and at noon had 115 fathoms when the observed lat. was 29° 6′ S. and after steering N. W. 8 miles, the land was seen at 4 P. M, bearing N. E. by E. distant supposed about 15 leagues.

Winds and Currents, near the Equator, and the Brazil Coast.—And of Ships which have been carried near the latter.

IT has been observed, that on the Brazil coast, the winds are periodical, blowing from S. S. E. and S. E. from March to September, the current then running to the northward; and from September to March, the wind blowing from N. E. and E. N. E. with a southerly current prevailing during the same period: vessels are therefore directed, to make the land to windward of the port they intend to touch at, according to the periodical winds blowing along the coast, which generally govern the currents.

When the sun is in the northern hemisphere, the winds on the Brazil coast, certainly incline more from southeastward than in the opposite season, when that luminary is south of the equator, for at this time they prevail at eastward.

It appears, that in any season of the year, if the coast be not made to the north of Cape St. Augustine, there is no difficulty in getting to the southward; for ships which have made the coast in lat. 7° and 8° S. which is considerably to the northward of this cape, even in the unfavourable season, found little difficulty in getting to the southward after making a few tacks, and experienced little or no current to the northward. But from March to October, in an *indifferent sailing* ship, it would be imprudent to make the land to the north of Cape Augustine, if it can be avoided. To the northward of Cape Ledo, or near Cape Roque, it certainly should not be made, on account of S. E. winds and W. N. W. currents, liable to sweep a ship round Cape Roque to the westward, which has frequently been experienced.*

* The transports with the ordnance stores on board, for the army of Monte Video, in 1807, by crossing the equator too far to the westward, were carried so far in this direction by the currents, that they could not get to the south-

Outward bound ships, which touch at St. Salvador in every month of the year, after leaving this place, proceed to the southward without difficulty, for the winds mostly draw to E. S. E. in lat. 13° or 14° S. even in the most unfavourable season for sailing to the southward, and they are frequently variable near the coast, with land breezes at times. About Cape Frio, the prevailing winds are northeasterly all the year, though often variable, and sea and land breezes, are mostly experienced in the entrance to Rio Janeiro.

King George, 1st June 1792, crossed the equator in long. 30° W. with the view of getting quickly into the S. E. trade, but being in the stream of the equatorial current, she was carried greatly to the westward, and saw the land about Cape Roque at 5 P. M. 6th June, bearing from S. S. E. to S. W. by S.; having steered south 4½ miles till 6 P. M. she tacked to the N. E. Cape Roque bearing S. S. E., a remarkable hummock south, breakers on Cape Roque Shoal S. by W. distant 3 or 4 miles, and off the land 8 or 9 leagues. She stood from hence, close hauled, to regain the variable winds in north latitude, in order to make easting, which considerably prolonged her passage to India.

Active, bound to Pernambuco, passed the Cape de Verd Islands in long. 31½° W., and on the 4th March 1811, she crossed the equator in long. 35° W., and afterward made the coast of Brazil far to the west of Cape Roque. March 25th, a pilot came off, and carried her into Parrazira Bay, where she procured a pilot to conduct her to Pernambuco. Coasting along to the eastward, with land breezes at times, the boat was daily sent on shore for provisions, and she anchored in the night, or when the wind was contrary, as the tide or current ran mostly to the westward.

Salinas Bank, was found to extend parallel to the coast a great way* to the westward of Cape Roque, being a steep coral reef above and under water, with a channel of 1 to 2 miles broad between it and the shore: here the pilot got the Active once aground, and at another time into 2½ fathoms. By crossing the equator far to the westward, and consequently getting far to leeward of Cape Roque, this ship's passage was so much prolonged, as to render her voyage unprofitable, which occasioned a suit at law between the freighters and proprietors of the ship.

ward of Cape St. Augustine, and were twice obliged to stand to the northward, into variable winds, to regain easting, after having made two fruitless attempts to get into the regular southeast trade. This happened in May and June.

* The Brazil pilot says 30 leagues, in a N. W. direction.

GENERAL STEWART, August 16th, 1803, lost N. E. trade in lat. 14° N. long. 27° W.; was then perplexed with light breezes from S. to S. S. W. and stood to the S. E. On the 31st, was in lat. 6° N., long. 15° W. stood to the westward till in lat. 1° N., long. 27° W. September 10th, the wind then veering to S. S. E., saw Fernando Noronha and anchored there on the 15th. The well being nearly dry, and a high surf, procured only 9 butts of water at this place; sailed 19th, and made the Brazil coast on the 20th, in lat. 7° 10′ S.; on the 21st and 22d, the wind at S. S. E. to S. E., tacked several times at 5 or 6 miles from the shore; at noon 22d, in lat. 7° 48′ S. the wind veered to E. S. E. and E. by S., stood to the southward, and saw the coast no more.

WARREN HASTINGS, May 5th, 1803, lost northeast trade in lat. 9° 30′ N. long. 23° 40′ W. and got S. E. trade 21st, in lat. 2° N. long. 25 W. The trade being scant, made the Brazil coast 28th, in lat. 8° 30′ S.; on the 29th, the wind veering more easterly, lost sight of the coast in lat. 9° S. Whilst in sight of the land, had soundings from 25 to 40 fathoms.

TELLICHERRY, May 10th, 1802, lost northeast trade in lat. 7° N. long. 25° W. and got S. E. trade 14th, in lat. 3° N. long. 27° W.; had the trade far southerly, and saw Fernando Noronha 20th; tacked to northeastward for 30 hours, saw the island again 22d, and passed to leeward of it; saw the Brazil coast 24th, and was obliged to tack frequently near it for several days, the wind southeasterly; in lat. 8° 06′ S. on the 30th, with a steady wind at S. E. and S. E. by E. was enabled to stand to the southward without tacking again.

CUFFNELLS, May 28th, 1802, lost northeast trade in lat. 8½° N. long. 22° W. and got S. E. trade June 4th, in lat. 5° N. long. 21° W. From the equator, had a current setting W. and W. by N. from 30 to 52 miles daily, till the coast of Brazil was in sight 14th, in lat. 8° S.; tacked to the N. E. and stood on this tack near two days, then tacked to the southward, and saw the land no more.

SIR EDWARD HUGHES, May 23d, 1802, lost N. E. trade in lat. 6° N. long. 23° W. and got the wind at S. S. E. 25th, in lat. 5° N. long. 23° 30′ W. The trade kept far south, and the current set westward strong. June 2d, saw Fernando Noronha, made several tacks till the Brazil coast was seen about Cape Augustine, June 7th; had some hard squalls here. In lat. 13° S. the wind veered to E. S. E. and to E. by N. June 13th, in 17° S. latitude.

HENRY DUNDAS, October 20th, 1797, lost N. E. trade in sight of the Cape Verd Islands, and crossed the equator November 4th, in long. 30° 30′ W. with a scant S. E. trade. On

the 8th, made the Brazil coast in 6° 50′ S. about Cape Ledo. The wind became more favorable near the land.

BOMBAY CASTLE, and fleet, June 27th, 1795, at 3 A. M. in lat. about 7° S. had 18 fathoms on the Brazil coast, and tacked; the wind continued from southeastward, with very little current, till she arrived at St. Salvadore, July 7. They had 6½° westerly current from Palma to the coast of Brazil.

EUROPE and fleet, October 16th, 1805, lost northeast trade in lat. 11° N. long. 28° W. and got southeast trade 26th, in lat. 4° N. long. 29° W. November 4th, in lat. 6° S. saw the Brazil coast; had the wind near the land at E. by S. and E. S. E. stood to the southward along the coast: on the 7th, were in 18 and 19 fathoms, off Pernambuco or Fernambuco point; on the 8th, in lat. 10° 40′ S. the wind veered from E. by S. to E. by N. and E. N. E. no land in sight; worked into the Bay of All Saints, on the 10th, the wind at E. and E. by S. By crossing the equator too far west, the Company's ship Britannia, and King George transport, were wrecked on the Roccas Shoal in the morning of the 1st November, and several other ships in the fleet, narrowly escaped this dangerous shoal.

Brazil Coast.—Headlands, and principal Harbours, with Sailing Directions.

CAPE ROQUE, the N. E. extremity of Brazil, appears to be in lat. about 5° 10′ S.* long. about 35° 40′ W. by observations taken in the East India ship King George, in 1792, and the northern extremity of the breakers on the bank of Cape Roque, she made in lat. 4° 53′ S. which lies 6 or 7 leagues northward from the Cape.

CAPE LEDO, in lat. 6° 50′ S. long. 35° 7′ W. by mean of several ship's lunar observations, forms the outer extreme of the land bounding Paraiba river, which is a place of considerable trade, having 2½ fathoms on the bar at low water. Between Cape Roque and this place, the coast is generally lined by reefs, with soundings extending to a considerable distance, but near Cape Ledo the bank is steep, as the distance from no sound-

* Cape Roque is probably a little more to the south than here stated, although laid down in lat. 5 degrees S. in several charts. The Active, already noticed, of having fallen to leeward of this cape, made it in lat. 5 degrees 34 minutes S. by noon observation, when passing between it and the bank in 1811; but probably more confidence should be placed in the observations of the King George, though taken at a considerable distance from the cape, as they *seem* to have been inexperienced observers on board the Active.

ings to 14 fathoms near the shore, is only about three miles, which makes great caution necessary in approaching this part of the coast in the night, because the reefs project out to a considerable distance.

CAPE ST. AUGUSTINE, in lat. 8° 28′ S. long. 34° 50′ W. is formed of a ridge of high land projecting into the sea, with the fort N. W. de Nazareth on the summit of the hill over the cape.* Pernambuco in lat. 8° 12′ S. about 6 leagues to the northward of this cape, is a place of great trade, being the port of the city of Olinda: the entrance is narrow, with 4 fathoms in it at low water, nor is there room for many large ships inside, by which a pilot is necessary to conduct a ship into this port. The reef which forms the harbour extends nearly north and south, having a small tower or fort on its northern extremity, and ships steering westward for the entrance of the harbour, must haul close round this extremity of the reef, and be ready to drop their anchor in the harbour, which stretches southward within the reef. Large ships in want of refreshments, may anchor in the road well out, and get the needful supplies, where they will be enabled to proceed to sea, on the appearance of blowing weather.

From Cape St. Augustine, the coast takes a direction about S. by W. several leagues, then south southwesterly to the reefs of St. Francisco in lat. about 10° 48′ S. which lie about a league off shore, having a passage within them for small vessels. From hence, the coast lies nearly S. W. to the Bay of All Saints, having a reef lining it in many places, which forms a few intermediate harbours for small vessels.

If a large ship make the land about Capes Ledo or St. Augustine, it will be prudent not to approach it under 25 or 20 fathoms in proceeding to the southward, for with *due caution*, the soundings are generally a sufficient guide.

BAHIA DE TODOS SANTOS, or harbour of S. Salvadore, is an extensive basin with several islands in it, the entrance being bounded by the large island Tapoa or Taporica on the west side, and on the east side of the peninsula on which the city of St. Salvadore is built. Cape St. Antonio, or Cape St. Salvadore, is the S. W. extremity of the peninsula, on which stands Fort Cabo, situated in lat. 12° 58′ S. long. 38° 13′ W. by mean of lunar observations taken in the E. I. company's ships; from the cape a shoal bank projects south and southeastward to the distance of 2 miles, called the shoal of St. Antonio, on which the tide makes ripplings, but there is said to be not less than 4

* A new lighthouse has been erected at Pernambuco. Being revolving, it can be readily distinguished from the lights of the city.—*Extract from the Freeman's Journal, Philadelphia, April 17th*, 1822.

fathoms water on it. The island Taporica is lined with a shoal bank that bounds the west side of the channel, and must be avoided: the depths are 10 and 12 fathoms in the fair track, a little outside the entrance of the harbour, deepening to 15 or 20 fathoms farther in.

With a fair wind, when Cape St. Salvadore is approached within 4 or 5 miles, it should be brought to bear N. by E. or N. by E. ½ E., and when Fort Cabo is on this bearing, steer N. ½ E. or N. by E. direct for the harbour, borrowing on the cape bank if the wind be easterly; or as soon as Monserrate Point is seen open with the cape point, (which is the first point to the northward on the east side of the harbour) steer right in.

The pilots say, that a ship may borrow on the cape bank to 5 fathoms with a steady breeze, but not under 15 fathom with little wind. Should the wind be at E. N. E. or N. E. a ship may work in with safety, taking care to avoid the western shore; and a pilot will come off, if the signal be made. Having entered the harbour and neared Fort Balco, pass it in 14 fathoms about half a mile distant, then anchor abreast the city, in 8, 10, or 12 fathoms, about 1 or 1½ mile off: the bottom is sandy in some places.

The Glatton moored in 8 fathoms, sand, shells, and coral, had the flagstaff of the fort abreast the city bearing E. N. E. ½ N. distant 1 mile, Fort Balco S. ½ W. about one mile, extremes of the island Taporica from N. W. by W. to W. S. W. distant 4 or 5 miles. There is a lighthouse on the cape point, to guide ships in the night. High water at 2½ hours on full and change of moon.

This port is sometimes visited by outward bound East India ships in want of refreshments, but its situation being in the middle of the S. E. trade, navigators are cautious of touching here, thinking they may find it difficult to get to the south afterward, on account of adverse winds, said (in some old books) to blow along the coast from the southward from March to September; but the East India ships have never found any difficulty in getting from this port to the southward, even in the most unfavourable months, June, July, and August, for the wind generally draws well to the eastward here, and more so, as you proceed to the southward.

Porto Seguro, or Seguiro, in lat. 16° 41′ S. is a place of considerable trade, but will not admit large ships, and the road outside is said to be foul ground: shoals lie about 5 miles to the E. N. E. of the river's mouth, which must be left to the northward in proceeding to the road. If a ship touch here a pilot will be necessary.

Abrolhos Bank, or Brazil Bank, extends from lat. 16°

to 19° S., having various depths from 20 to 60 fathoms, and on the parallel of 18° 36′ S. it projects about 55 leagues east from Point Abrolhos, or to long. 36° W.; but farther to the northward it approaches much nearer to the coast. It seems not to be a continued bank, but probably is formed of several detached parts, with deep water between them; as soundings have been got by many ships far out on the bank, when others between them and the coast, had no bottom with 100 fathoms of line.

Royal Charlotte, Brunswick, and Glatton, left St. Salvadore 5th June, 1803, and on the day following, in lat. 16° 0′ S. long. 37° 48′ W. had soundings of 22 and 25 fathoms; steered from thence 15 miles S. S. E. to S. E. gradually deepening to 60 fathoms.

Warren Hastings, 3d June, 1803, in lat. 16° 0′ S. long. 38° 42′ W. by lunars, and 38° 54′ W. by chronometers, had 23 fathoms, then steered between S. ½ E. and S. S. E. 19 miles, in 22, 23, 25, 30, and 35 fathoms, and soon after had no ground 70 fathoms.

David Scott, 28th June, 1810, in lat. 16° 35′ S. long. 38° 26 W. had from 19 to 24 fathoms; the coast in sight, bearing W. S. W. distant about 17 leagues.

The soundings of the ships stated above, appear to have been on the northernmost part of the Brazil Bank, which is probably a detached part projecting about 26 or 28 leagues from the coast, as all these ships lost soundings steering south southeastward.

Busbridge, 5th June 1792, in lat. 18° 35′ S. long. 35′ 54° W. by chronometers, and 35° 56′ W. by lunar observations, had soundings 30, 32, and 33 fathoms coral rock, probably near the eastern verge of the Bank of Abrolhas.

Dorsetshire, got no soundings, in passing not far from the situation where the Busbridge had ground. Variation on the verge of the Bank 3° E. 1803.

Sir Edward Hughes, 13th June 1802, in lat. 17° 18′ S. long. 36° 15′ W. got no ground with 100 line; steered S. E. by S. 32 miles, no ground 100 fathoms; steered S. E. 22 miles, and got no ground 65 fathoms.

Upon this outer Bank of Abrolhas, to the eastward of the islands of the same name, there is no danger, and it is a guide for ships approaching the coast, although there appear to be deep gaps or chasms in it, particularly to the northward of 18° south latitude.

Abrolhas Islands, in lat. 18° 1′ S. long. 38° 25′ W. distant about 12 leagues from the coast, consist of 4 small isles near each other, with some rocks and shoals adjoining; they are destitute of water, but abound with rats and turtle. There is said to be 6 or 7 fathoms off the east point of the easternmost

island, which is the largest, and that a ship might anchor between it and South Island, but Capt. Isbister in hauling round the south side of the latter, in search of turtle, got his ship aground on a coral shoal. They are apparently safe to approach from the eastward, as Capt. J. Crabtree in January 1811, passed outside of them at 8 or 9 miles distance, and had not less than 15 fathoms regular soundings, and they seemed clear of danger on that side.

To the west of the Abrolhas Islands, there is a channel 5 or 6 leagues wide, with 9 to 14 fathoms sand and mud, which is seldom used except by coasters. On the west side, toward the land, this channel is bounded by shoals and rocks above water, called the Hats.

From Abrolhos Point, the coast lies about S. by W. and is safe to approach, if a birth be given to the small isles which lie near it in some places, particularly the Threé Brothers in lat. about 19° 30′ S. When round Espirito Santa, the coast trends more to the S. W. to Cape St. Tome, to the southwestward of which, lie the three Isles of St. Ann, about a league or more from the shore, affording shelter and good anchorage under them; and fresh water may be got at a village to the northward of them, in Formosa Bay.

Cape Frio (Cold,) about 11 or 12 leagues to the S. W. of the Isles of St. Ann, is formed by an island, having a channel 1½ mile wide between it and the main land, but although the depths in it are 7 and 8 fathoms, it is not safe, on account of eddies and strong currents. Ships bound for Rio Janeiro, steer always to make this Cape, which is situated in lat. 23° 1′ S. and in long. 41° 50′ W. or 1° 4′ E. from Rat Island in Rio Janeiro Harbour, by Capt. P. Heywood's chronometers; this is probably very near its true situation, although the observations of Captains Torin, Mortlock, and Krusenstern the Russian circumnavigator, place it in long. 41° 42′ W.

The Cape appears like two paps or hummocks, and close to it on the N. E. side, lie several small isles, which like the island that forms the cape, have deep water close to them. The land about the Cape is of middling height, appearing at a distance like islands; to the northward, the land is higher. From Abrolhos Bank to this place, soundings are generally got at a moderate distance from the coast.

Rio Janeiro Harbour's Entrance, is about 20 leagues West from Cape Frio, and ships approaching the latter, must be careful not to run into the bay to the north of the Cape, with the wind easterly or S. E. in the night, which has happened to several ships by mistaking the latitude of the Cape, and nearly proved fatal to them.

In steering from Cape Frio to the westward, keep 3 or 4 leagues off shore, and when the distance is 9 or 10 leagues west from Cape Frio, you will see the Sugar-Loaf, if clear weather, and soon after Rodondo, (or Round Island) bearing about west, appearing like a small hummock, and also the extremity of the land to the westward; steer direct for it, and you will soon see Raza, or Razor Island, and in sailing along, will pass the Marice Islands, situated near the shore, distant 5 leagues or more from the entrance of the harbour, which are 2 or 3 small low islands. Round Island, by chronometer, bears from Cape Frio S. 85° W. distant 64 miles, and is in shape a perfect haycock.

Razor Island is low, but has a kind of small peak, and seems as if sliced off to the northward, by which it probably got the name of Raza:—When you make it bearing westward, it resembles a slipper. The soundings are 30 and 35 fathoms near these islands on the outside, and to the eastward of them. Steering on for Razor Isle, you will make the Islands Paya and Maya,* which are 4 to 6 miles eastward of the harbour, and lie near the shore, off Point Tarpu:—Paya is the outermost, and is on with the Sugar-Loaf bearing N. W. by W. ½ W. by compass; Maya is within it, and there is another small islet within these, so near the shore that it is not always perceived. Razor Island bears from Round Island by compass, E. by N. ½ N. and from the Sugar-Loaf S. by W.

The Great Channel, leading to the harbour, is between the Paya Islands to the eastward, and Razor Island westward:—when these islands are approached, the entrance of the harbour will be perceived, which is formed by the Sugar-Loaf to the westward, and Santa Cruz point to the eastward, on which is a fort. Having the Sugar-Loaf open to the westward of Paya, steer direct for it; and should the wind not be likely to carry you fairly into the harbour, anchor in 10 or 12 fathoms, when you are within one half, or three quarters of a mile of a small isle, called Cutunduba, with it bearing about N. W. by compass, which isle lies just without the Sugar-Loaf. If you go farther in, the swell on the bar will make you roll your ports in the water; and it is imprudent to anchor between the Sugar-Loaf and Santa Cruz, in the narrow part of the entrance to the harbour, where the depth is greater, the bottom rocky, the channel not a mile wide; with a tide rushing through it, between the rocky shores on each side, at the rate of 6 or 7 miles an hour on the springs.

The sea breeze generally sets in before mid-day in the entrance of the harbour, and continues till about sunset. You should not enter between the Sugar-Loaf and Santa Cruz point

* The Nereus passed between them, and Capt. Heywood observes, that there are good passages between all the islands which lie off the entrance of Rio Janeiro harbour.

with an ebb tide, and the sea breeze far expended. Several ships, at different times, have been nearly lost, by anchoring in the gut between them.*

If you do not get a pilot outside, keep nearer Santa Cruz point than to the Sugar-Loaf, in passing between them. There is a fort called St. John, a little above the Sugar-Loaf, which with Santa Cruz Fort on the opposite side, command the entrance of the harbour. When past the latter, the course up the harbour is about N. by W. ½ W. stand boldly on for the anchorage abreast the city, if there is a moderate commanding breeze; and you cannot have a more convenient birth for watering, &c. than with the principal church in one with the small Isle Ratos, or Rat, S. 53° W. by compass, and the flag on Villegagnon Fort on with the Sugar-Loaf S. 8° E. where you will be abreast the watering place, in 17 fathoms mud and sand. Isle Cobra lies before the city, and some ships pass round the north part of it, and anchor before the monastery at the N. W. end of the city.

If the breeze is light and flattering, as soon as you pass Santa Cruz point, haul up to the eastward; for should you be obliged to anchor short, the ground is good on this side. The inner harbour lies within the islands Cobra and Emaxados. On the N. W. side of the former, there is a most convenient place to heave down ships of any size.

Rio Janeiro harbour is easy of access, readily known by the remarkable land about it, and is very commodious. You should moor as soon as possible, the tides being much influenced by the winds, and the latter so variable, that it is difficult to keep a clear anchor 24 hours: it is high water at 4½ hours full and change, the ebb then running much longer than the flood, and the velocity 3½ or 4 miles per hour. Plenty of fruit, vegetables, and indifferent beef, are obtained at this port, but a ship intending to stop only a few days, ought to make application for a much longer time, as some of the governors have been known to refuse strangers sufficient time to repair, and refresh their ships' crews.

* In September, 1803, H. M. ships Sceptre and Grampus, with the outward bound fleet for India, steered in for the harbour in the afternoon, 16th September. At 7 P. M it became squally and dark, with thunder, lightning, and rain; the shore was discernible only by the flashes of lightning. The journal of the Essex states, that they anchored at 8 P. M. near the Sugar-Loaf, and nearly drove on shore with two anchors down. The Earl Spencer, also anchored at 8 P M. in 19 fathoms, with the best bower, and soon perceived they were near the Sugar-Loaf, which obliged them to let go the small bower and sheet, to prevent being driven on shore. The ebb tide was setting round the point to the southward, near 7 miles an hour. This ship's journal, mentions, that all the fleet were in danger in different ways, and that a flash of lightning saved the Sceptre from running on shore on Santa Cruz point.

Rio Janeiro city, called also St. Sebastian, is the capital of all Brazil, and the residence of the viceroy. The water is conveyed in pipes to the jetty, where boats lie and fill their casks with ease, as the rise and fall of the tides are inconsiderable. Hogs and poultry are dear; yams and pumpkins are easily obtained, which are very useful for a scorbutic ship's company, as they will keep a long time at sea.

When bound out, if the wind is steady, steer direct for Santa Cruz point, but edge over to the eastward as soon as you can if it is light, till Santa Cruz bears about S. S. E. ½ E. Should you be obliged to anchor, go no farther out, than to bring Villegagnon flagstaff in one with the peak at the back of the town, bearing about W. by S. ¾ S., and square Island Fort on with the west end of Cutanduba island, where you will have 15 fathoms mud and sand:—this anchorage is about midway betwixt Villegagnon fort and the eastern shore. Farther out the ground is foul and rocky. There is a small perpendicular islet with a church and house on its summit, elevated about 100 yards from the sea, having its communication with the main by a bridge: on the top of this islet there is a well of excellent water, the water not more than 20 feet from the surface.

The reason for advising to keep to the eastward, as above described is, should you weigh in the morning with the land breeze, which is at first generally very light, you are in the fair way of the tide, which will set you right out; but if more to the westward, it would be liable to horse you upon Square Island, which consists of some rocks with a fort on them, just within the Sugar Loaf. The bar is about a half or a quarter of a mile without Santa Cruz point; the least water on it is thought to be six and a half, or a quarter less than seven fathoms at low water spring tides. It is about half a mile in breadth, the depth increasing gradually on each side. The Sugar Loaf is in lat. 23° 00′ S. and about 62 miles west from Cape Frio.

Rio Janeiro, affording abundance of refreshments, is frequented by ships of war, and others bound to India with troops on board, for obtaining needful supplies; but unless they are in real want of water or other refreshments, or otherwise obliged to run for a port, it seems not adviseable for ships destined to India, to touch at any of the ports on the coast of Brazil, as it must considerably lengthen the passage. Should a squadron of ships be absolutely necessitated to stop somewhere, it may however be preferable to go into Rio Janeiro, rather than into False bay at the Cape of Good Hope during the winter season, where supplies are not so abundant, nor the anchorage so safe for a fleet or large squadron.

Ilha Grande, in lat. 23° 17′ S. is about 4 leagues in length, the eastern channel into its harbour being about 16 leagues to the W. S. W. of Rio Janeiro entrance, which is very safe, as is also the other channel to the west of the island. The whole of the channel formed between Ilha Grande and the main, is a spacious and safe harbour for ships of any number and size, with soundings from 6 to 15 fathoms. There is fresh water on the west end of the island of Meranbaye, which bounds the east side of the eastern channel, and wood may be got on the contiguous islands: refreshments may also be got at the Village dos Reis, situated on the main, opposite the middle of Ilha Grande.

Island St. Sebastian, in lat. 23° 45′ S., about 22 leagues to the W. S. W. of Ilha Grande, forms a safe harbour between it and main, by entering from the northward and keeping near the island, as the main land is lined by a shoal bank. Refreshments may be got at the villages on the island, or at those on the continent. The south entrance is not above a mile wide, but with proper caution, may be navigated in a middling sized ship, as Captain Heywood passed between the island St. Sebastian and the main, in the Nereus frigate, in 1810, where he lay two days during a S. E. gale, surveying the channel. He also passed between Ilha Grande and the main land.

Santos Bay, in lat. 24° 0′ S. about 13 leagues W. S. W. of St. Sebastian, affords safe anchorage from all winds, excepting those at S. E. and southward, and the town is four or five miles up the river. In this track the Alcatrasses Isles, having foul ground about them, lie about four or five leagues off shore, and five or six leagues distant from the island St. Sebastian to the southwestward.

Isle Redondo, or Round Isle, in lat. 24° 30′ S. and about six or seven leagues off shore, has a reef a little inside of it, extending about four miles parallel to the coast; to avoid which, ships that happen to get to the westward of Redondo, ought to keep it bearing to the northward of E. by N., for with it bearing E. ½ N. a ship will be within half a mile of the reef.

From Isle Redondo to St. Catherina, there are several other small islands nearer the coast than the former, and it is safe to approach, having in this space some harbours, the best of which is that of St. Francisco, in lat. 26° S. and Garoupas Road, in lat. about 27° S.

Island St. Catherina, extends about 10 or 11 leagues N. by E. and S. by W. the north end being in lat. 27° 19′ S. long. 47° 50′ W.: the channel between this island and the main, forms an excellent harbour for ships of every description; and it is navigable to the narrow strait near the middle of the island,

a little beyond which, stands the town of St. Catherina. From hence to the south end of the island, the channel will only admit small vessels out to sea.

The proper passage into the harbour is round the north end of the island, between it and the Isle Alvoreda, distant about two leagues to the northward; but a ship may pass occasionally betwixt this isle and the other small isles to the N. W. of it, or between the latter and the main if necessary, the depths being from 8 to 12 fathoms among those isles. Having rounded the north end of the island, steer to the S. W. and southward, keeping about midchannel between St. Catherina and the main, and anchor under the small Isle Atomeri, situated near the latter.

Atomeri Isle, is in lat. 27° 22′ S, observed by Dr. Horner, astronomer to the Russian voyage of circumnavigation, under the direction of my friend, Captain Krusenstern, who made the variation here 7° 50′ E. in 1803.

Here ships are well supplied with fruits, vegetables, and refreshments of various kinds, but the prices are not very low. Several small isles line the shores of St. Catherina on both sides, those off the south end extending about three leagues to seaward; and the soundings increase to 65 or 70 fathoms about 10 leagues east of St. Catherina.

Although neither the Spanish, or Portuguese charts, nor those published hitherto in this country, mark any soundings between Rio Janeiro and Rio de la Plata, yet every part of this coast seems to be fronted by soundings, in some places stretching to a considerable distance off shore.

From the island St. Catherina to Morro St. Marta, the coast extends about 20 leagues S. S. W.; from hence to Cape St. Mary, at the entrance of Rio de La Plata, the direction of the coast is generally about S. W.: and in this space it has no safe harbours for large ships, but the shore in most places may be approached to a moderate distance with safety.

Instructions and Observations for Navigating the Rio de la Plata, or River Plate.

By Captain Heywood of the Royal Navy.

AT Rio de la Plata Entrance, the prevailing winds during the summer months, from September to March, are northeasterly, with tolerably clear weather over head, but a dense atmosphere near the horizon. These winds haul gradually to the eastward as you advance up the river; and about the full and change of the moon, strong breezes from southeastward are common at this season, accompanied with rain

and foul weather. At Buenos Ayres, during the summer months, the S. E. winds are generally fresh in the day-time, hauling round to northward in the night.

During the winter months, from March to September, the prevailing winds at the entrance of the Plata are S. W. or more westerly: but up the river, more generally from the northward than the southward of west.

In the winter season is the best weather at Buenos Ayres, for the winds being chiefly from N. W. to S. W., the water is smooth, and the communication can be kept up between the shore and the shipping with more facility. The weather is sometimes foggy, but fogs are most common in the months of July, August, and September, prevailing more at the entrance of the river, and as far up as the S. E. tail of the Ortiz, than above these banks.

As it cannot be said regular tides exist in the Plata, but currents as uncertain in their duration as they are irregular in their rate and direction, no *certain* allowance can be made for them; therefore a *ground log* should be used, to find the course made good and distance run.

The tides, when the weather is settled, and the winds moderate, seldom rise or fall more than 5 or 6 feet; though at Buenos Ayres, 8 miles distant from the city, we found in the Nereus, when the winds were strong at N. W., sometimes only fifteen feet water; while with strong breezes from E. S. E. to S. S. W., the depth was upwards of five fathoms: but, except on such extraordinary occasions, we had between 17 and 22 feet water.*

The river Plata has many singularities; which arise, perhaps, from its formation being different from any other known river. Its entrance being very wide and shallow, it is affected by every change of wind in a remarkable manner; that a shift of wind may be predicted almost to a certainty, by observing carefully the state of the barometer, and the set of the currents, which usually shift before the wind. In calm weather, the currents are generally very weak, setting up and down the river alternately, and nearly as regular as tides. When the winds are variable the currents are equally so; and I have known the ship to be *current rode* four different ways in less than six hours. When the current comes in from eastward along the north bank of the Plata, a northeasterly wind may generally be expected to follow, and at the same time (should the wind have been previously to the S. E.) the barometer will fall a *little;*

* I have heard, however, some marvellous stories, of the river having been almost dried up, across from Buenos Ayres to Colonia, during heavy westerly gales.

but much *more*, if the transition be quick from *southwest*, without stopping in the southeastern quarter.

When the wind continues in the northeast quarter, proportionate to its strength, the mercury is more depressed than with any other wind, and then there is usually a set *into* the river on the north bank, and *out* on the *opposite* bank. Indeed, whilst the winds are between N. E. and S. S. E. the current generally runs to the westward, past *Monte Video*, though without much augmenting the depth of water off that place, but filling the river above the banks.

Winds between N. N. E. and W. N. W. make the water lowest; the *outset* being then strongest along the south bank of the river, past the points del Indio and Memoria; but very inconsiderable along the north bank.

Prior to a southwest gale, or *Pampero*, the weather is usually very unsettled, with unsteady and variable winds in the north and northwest quarters; preceded by a considerable *fall* of the mercury, though it usually *rises* a little again *before* the wind shifts to the *southwest;* and often continues to rise, even though the wind may increase from *that quarter*. Before these set in at Buenos Ayres, the current runs up and fills the river unusually high; at the same time, as strong an *outset* is experienced along the north bank, which continues whilst the winds are strongest from W. S. W. to south, seeming to prove, that these winds force up from the southward, a large accumulated body of water past Cape Antonio, which can only find a passage out again by the north shore, where they increase the depth of water, as well as up the river, and particularly in the shallow harbour of Monte Video. Whilst these S. W. winds blow, the air is cold, and the atmosphere clear and elastic, in a degree rarely to be met with in any other part of the world. They are generally succeeded by some days of fine serene weather; the wind continuing moderate from the southward, or varying to the eastward.

I have never known the velocity of the tide or current in any part of the river, to exceed four knots per hour; although it is reported, sometimes to have run six or seven miles an hour!

As the winds outside the river Plata, and particularly about Cape St. Mary, are most frequent from the northeastward and northward, except when the southeast summer, and southwest winter gales blow about the times of new and full moon, I consider it most adviseable, for ships bound into the river, to get in with the land about the latitude of that cape, which is 34° 40′ S., and its long. 53° 54′ W. of Greenwich, or 2° 09′ E. of Monte Video.

In lat. 33° S. the bank of soundings extends off the land full 36 leagues, where the depth of water in long. 50° 20′ W. is 94

fathoms, and the quality of the bottom dark olive coloured mud, or ouze, as it is all along the outer verge of the bank. In lat. 34° S. and 30 leagues from the land, the bank is steep; and the soundings decrease quickly in standing to the westward, to 25 fathoms 20 leagues from land.

In lat. 34° 20′ S. long. 51° 50′ W., or about 30 leagues east of the Great Castellos Rock, the depth is 63 or 64 fathoms dark mud. In standing for the land, between the Great Castellos and Cape St. Mary, the water shoals in a short distance from 60 to 25 fathoms; and the quality of the bottom changes to sand, which grows *coarser* as you approach the coast; and as far as 7 miles off shore, is intermixed with *shell. This bottom* is found *only* in, to the northward of the latitude of Cape St. Mary, except very close in with this cape.

To the southward of 34° 40′ S. the bottom is chiefly mud, intermixed with *fine* sand or gravel; and if a ship happen to be set to the southward of Cape St. Mary, as she hauls in for the land, yet keeps to the *northward* of *Isle Lobos*, she will get out of fine sand, into dark mud; which is the quality of the bottom (chiefly) between Cape St. Mary and Lobos; as well as 8 or 9 leagues to the eastward of that island; and the depth of water between them, is generally 26 to 20 fathoms.

In lat. 35° S. long. 52° W., or 42 leagues *true* east of Lobos, there are about 90 fathoms water, dark sandy bottom; from thence, the bank of soundings takes a S. W. direction. East of Lobos 27 leagues, the depth is 25 fathoms; and in steering in, on its parallel, the same depth nearly continues till very close to that island. But if set a little to the southward of Lobos, the water will shoal even to 10 fathoms perhaps, on a hard sandy or gravelly ridge that extends all the way from the *English Bank*, in *its* parallel as far as long. 52° 30′ W.; or full 18 leagues to the eastward of the meridian of Lobos.

Thus, the *approach* to this river cannot be considered dangerous, if proper care be taken in navigating, and due attention paid to the *lead*, and the *course* steered.

Captain Bouverie, gives the following remarks :—

" Cape St. Mary,* is a low point, fronted by rocks, and

* Remarks of Captain John Butler, of ship Thalia, of Philadelphia, on the entrance of the River Plate.

" There appears to be a serious error in Captain Bouverie's description of Cape St. Mary's. He has described it as a low point, fronted with rocks, with a house about 6 miles to the north of it, a row of trees to the north of the house, and about one mile south of the house, a bluff point with a few rocks in front of it close to the shore. Now there is no point of land between Rio Grande and the Island of Lobos, that answers this description, but the point of Laguna Blanca, on which stands Estancia Ignez of the Spanish charts, which evidently is the house and trees described by Captain Bouverie; and as the difference between the latitude of the true Cape St. Mary's, and the point of the Laguna Blanca, is only eight miles, ships coming in from sea, uncertain of their lon-

" the direction of the coast to the westward of this Cape, " becomes more *westerly* than at any other part *northward* of " it. About 6 miles *north* of it is a house, with a row of trees " northward of the house, (probably a fence of high prickly " pear-bushes,) which is very remarkable.

" About a mile *south* of the house, is a bluff point, with a few " rocks at the foot, which is remarkable, being different from " the rest of the coast, the general character of which is a *sandy* " beach. You cannot fail knowing the cape by these marks, " when running down the coast *near* it: but at a considerable " distance off, you will not perceive them.*

" To the northward of the Cape, between it and Palma, you " have 10 or 11 fathoms at a little distance from the shore.

" Ships generally make the land with N. or N. E. winds; " therefore it is best to keep in the latitude of the cape or a little " to the northward of it, till you get soundings, as the current " sets to the S. W.; but do not make the land north of the cape; " for although there seems no real danger, yet the water in many " places is *shoal* a long way off the land, and would alarm stran- " gers.

" In lat. 33° 27′ S. long. 52° 09′ W. is a shoal where we " found 9 fathoms water; which is probably a ridge, running " in that parallel of latitude all the way to the shore. In lat. " 34° S. is some tolerably high land, on which is a Spanish for- " tress, called Fort Teresa; being a square, with bastions at " the angles, and stands about a mile from the beach. About " 6 leagues N. N. E. from it, is a mark set up, as the termination " of the Spanish territories. Being in the latitude of Cape St. " Mary, and having got ground in 28 or 30 fathoms water, fine " sand and shells, you may reckon yourself 20 leagues off shore: " with from 15 to 20 fathoms, sand and clay mixed, you are " not far off the land. When you have not seen the land before " night, be sure to keep to the northward of the cape by your " reckoning, as the current sets to the southward, with north " and N. E. winds: with S. and S. W. winds, it runs strong " the other way."

gitude, and making the point of Laguna Blanca, will, from Captain Bouverie's description, take it for Cape St Mary's, and conclude themselves 47 miles from the Island of Lobos, when they are in reality only 17 miles from that island; and if it should be the approach of night, they would thereby subject themselves to the danger of running on Lobos, when they would suppose themselves 30 miles from it. Lobos is a low island of black rocks, and the cries of the numberless swarms of seals would warn a vessel of her approach to it in a fine night, but in blowing weather they could not be heard. The soundings within 5 miles of the point of Laguna Blanca, agree exactly with the soundings described by Captain Bouverie, abreast of St. Mary's."

* The Nereus tacked in 12½ fathoms water, the prickly pear-hedge, on with Cape St. Mary, bearing north by compass, and the breakers stretching to the S. E. of the Cape N. 7° E.; and her distance from the cape was about 3 miles.

Agreeing with Capt. Bouverie, that it is generally adviseable to make the land about Cape St. Mary, I would recommend, if the wind be between S. E. and N. N. E., to enter the river on the *north side* of the English bank, passing Lobos on either side, according to the wind and state of the weather. There is a good passage between Lobos and the main, having 17 to 14 fathoms water.

Lobos Island, is in lat. 35° 01′ S. and long. 54° 39′ W., or 1° 24′ east of the Mount Video. It bears about *true* S. W. from Cape St. Mary, distant 41 miles. Variation off it, 13° easterly in 1813.

When within 3 or 4 leagues of Cape St. Mary, in 17 or 18 fathoms, S. S. W. by compass is a fair course to steer for passing *outside* of Lobos in the night-time; for, with the wind from the eastward, or N. E., the set along shore *into* the river must be guarded against. Steering this S. S. W. course, the depth of water will increase to 20 and 22; and some casts, perhaps of 25 or 27 fathoms, (if you are set neither to the westward nor to the southward of it,) and the bottom will change, first to sandy mud and then to dark blue mud, as you approach the latitude of Lobos. If you are set to the *southward*, in steering S. S. W., you will not deepen so much; the bottom will keep *sandy;* and when you approach the latitude of Lobos, you will have no more than 19, 18, and 17 fathoms; but if you are set to the *southward of Lobos* a few miles, you will have hard casts of from 16 to 10 fathoms, and may rest assured of being on the parallel of the English Bank, and may therefore make a west northerly course *true*, till you find the bottom *soften;* as it is all dark blue or greenish mud in the channel, between the foul ridge in the English Bank and the north shore, all the way up to Monte Video, in the fair way from Lobos. When off Lobos, if the weather threaten, and it should be likely to blow, a ship will find safe anchorage in the harbour of Maldonado, sheltered from southerly winds by the island of Goritti, which bears N. 42° W. *true* 11 or 12 miles from Lobos.

" Captain Bouverie, observes, that, the Spanish surveys of " this bay, mark sufficient depth of water for any ship between " every part of the island and the main; however, it cannot be " safely entered but by small vessels, except to the *westward;* " and you must not go farther in than to bring the N. W. point " of Goritti to bear S. S. W. half W., or S. W. by S. by com- " pass, with 4½ or 5 fathoms stiff clay. With southerly winds, " there is in the east passage a heavy swell; and the water, " from the ground being uneven, breaks almost the whole way " across in bad weather. The Diomede (fifty gun ship) passed " through it to the anchorage before its dangers were known, " and had not less than 18 feet: but there are places with only

" 1½ fathom, very irregular soundings. There is a bed of rocks
" to the south of Goritti, from which the Tower of Maldonado,
" bears north, and the outer part of point del Este," E. N. E.
" ½ E.

" In the direct line of the entrance of the bay from the westward, lies a bed of rocks, having only 3, and 2¾ fathoms on some of the patches; from which the N. E. point of Goritti bears E. ½ S., northwest point of ditto E. by S. ¾ S., southwest point of ditto S. E. by S., Point Ballena bears W. by N. ¾ N., and the hill of Pan de Azucar, just within the extreme of Point Ballena.

" In mid-channel between these rocks and the island, there are 6 and 7 fathoms; and their distance from the island is about three quarters of a mile: there is 7 fathoms close to them, all round the western side. The watering place is on the main, close by a battery; and the stream loses itself in the sand, except when swollen by heavy rains; you have to roll your casks about 60 yards over the sand, and the water is very good."

Having Lobos bearing N. by W. by compass, distant 3 or 4 miles, you will have about 18 fathoms; and in making a *compass* course W. ½ S. by *ground log;* (having due regard to the wind and current at the time,) you will make the island of Flores *a-head* of you. In this track, your soundings will gradually decrease from 18 to 12 fathoms due south of Black Point, and to 7 or 8 fathoms when you approach within 9 or 10 miles of Flores.

Though Captain Bouverie says, " you may run quite up to Monte Video, either by night or day, by making a due west course, first trying the current to make allowance for it;" and though I have frequently done it myself, yet I would not recommend it as a general rule to be followed by *strangers.* Great care and attention to the course made good, and to the soundings, are indispensably requisite to those who attempt to conduct vessels during the night, *in any part* of this river; and even these, have often been insufficient to save ships from destruction.

Flores, bears *true* W. 4° 30′ N. from Lobos, distant 52 miles; it extends nearly N. E. and S. W., having a small hummock in the middle, and one at each end, that to the S. W. being 39 feet high. Between these, the land is low and marshy; and overflowed sometimes between the central and N. E. hummock. It may be seen at the distance of 5 or 6 leagues from a ship's deck, in clear weather.

There is good anchorage all round this island; but a reef extends in a N. W. direction from the north point about a mile. Seals and sea-lions, and various aquatic birds, resort to this

small island as well as to Lobos; and, in the months of August and September, great quantities of very excellent eggs may be procured. With the wind easterly, boats may land on the western side of Flores, particularly in a small cove very near the S. W. part of the island. From Flores, W. N. W., the Caretas rocks (above water) are distant about 5 miles, and there are 5 fathoms between them. True south, at the distance of 11 miles from Flores, lies the *north part* of the English Bank, having on it in that lat. 35° 08′ S., about 12 feet water: the depth of water, between Flores and the English Bank, is 7 fathoms all the way across, to within a very little distance of both. The English Bank, in lat. 35° 12′ S. generally has breakers; and, with a low river, is *above* water in some places. Its extent to the southward has not yet been accurately defined, and for 70 or 80 miles to the southeastward of it, the ground is said to be foul and uneven, and has not been explored.

Between the Archimedes Bank and the English Bank, there is a swatch about 5 miles wide, with 5 fathoms water, according to Captain Beaufort of the Royal Navy, who explored these banks in 1807.

Archimedes' Bank, the shoalest part with 2¾ fathoms, is 4 miles in extent about north and south by compass; and has 4 fathoms all round. The centre of it is in lat. 35° 12′ S., and the Mount Video bears *true* N. 22° W. from it, distant 20 miles. Besides this bank, there is a Small Knowl in lat. 35° 14′ S., which bears true south from the Mount Video, 21 miles, with not more than 3½ fathoms water on it, and about 4 fathoms all round. Passing to the southward of Flores, at the distance of 2 miles, you have 6½ or 7 fathoms, and may steer W. ½ S. by compass to pass point Braba, which bears true W. 4° N., distant 4 leagues from the S. W. end of Flores. This point is bolder to, than the land to the westward between it and the town of Monte Video, and may be passed close, in 4½ or 5 fathoms, at 1 mile or 1½ mile distance. The best anchorage for a frigate off the town of Monte Video, is with point Braba bearing by compass, E. by N. ½ N., the cathedral N. E. by N., and the Mount about N. W. by N., in 3½ or 4 fathoms, 2 miles or more from the town, with the harbour quite open. The bottom is all soft mud.

Monte Video Harbour, is very shoal, having only from 14 to 19 feet water; but the bottom being very soft, vessels receive no damage by grounding. Captain Bouverie says, " the wind at S. S. W. blows right into the harbour, causing a good deal of sea, and occasions the water to rise a fathom or more.

" In a long continuance of fine weather, the tides sometimes

(though not often) assume the appearance of regularity. They are governed entirely by the winds, and southerly winds cause the water to run out on the north shore strongest: fine weather, and a N. W. wind, make the water lowest. It is usual, in Monte Video harbour, to have an anchor to the S. E., and another to the S. W., and to take one in abaft from the northward; for the water forced in by the southerly wind, sometimes rushes out with astonishing rapidity; when the anchor to the north is of the greatest service."

The *Mount* Video is in lat. 34° 53′ S., long. 56° 03′ W. of Greenwich; being 1° 24′ W. of the island of Lobos, and 2° 10′ E. from the cathedral of Buenos Ayres.* On the summit of this mount, there is a fortified building, whose base is 42 feet 6 inches by 20 feet, used sometimes for a light-house. The diameter of the lantern is 10 feet 6 inches, and its elevation above the level of the sea 450 feet. At the base of the mount there are several runs of excellent water, particularly in two small smooth sandy bays, at the S. W. part of it, where ships in the outer road may supply themselves with ease; and another on the east side of the mount, just abreast of Rat Island, adapted to ships in the harbour.

Giving the preference to the passage on the north side of the English Bank, especially when the wind is any where between S. S. E. and N. N. E., on passing Lobos, because it may be expected most probably to shift, if it does at all, round by the north to the westward; though perhaps, not before that wind, and the in-set together, might carry a ship up to Monte Video: yet, if the wind should be to the *northwestward* at the time of making the land, it may be pretty confidently expected to shift next to the westward or S. W., and therefore a ship should not strive to beat up round Lobos in the north channel against an out-set, but stand at once over towards Cape St. Antonio; where by the time she could stretch across, she would most likely find a S. S. W. wind and N. W. current to run up with, along a weather shore to Buenos Ayres; or to Monte Video, if bound thither, passing to the westward of the bank of Archimedes, in about 5 fathoms water; or, if the Mount should be seen in time, it ought never to bear to the *westward* of *north* by compass, till approached within 5 leagues.

In standing to the southward from abreast of Cape St. Mary, with the wind southwesterly, a ship will have from 18 to 24 or 25 fathoms when in the latitude of Lobos, and about 12 or 13 leagues to the eastward of it; and making a *S. S. E. course*, the water will then shoal to 18, 16, 12, or 11 fathoms in crossing

* By the observations of Captains Heywood and Beaufort of the Royal Navy, who together surveyed this place, and observed upon the Mount.

the ridge, which hereabout is generally composed of grey speckled sand, mixed with stones; after which, the depth increases gradually to 35 or 36 fathoms, over a sandy bottom, in lat. 35° 40′ S., and long. 53° 25′ W. In lat. 36° S., and 15 or 20 miles farther to the eastward, you will deepen off the bank entirely. Having got as far to the southward as 36° S., you may consider yourself in the fair way for proceeding up on the south side of the English Bank, and if the wind serve, a *true* west course will be proper.

In lat. 36° S. the depth of water on the meridian of Cape St. Mary is 38 fathoms, the bottom fine grey sand like ground pepper. Steer to the westward on this parallel of 36° S., the depth will decrease to 19 or 18 fathoms *true south* of Lobos; and for 10 leagues further you have from this depth to 15 fathoms. But if from the lat. of 36° S. on the meridian of Lobos, you make a W. by N., or W. by N. ½ N. course *true*, you will shoal the water to 8, or 7½ fathoms in lat. 35° 45′ S., on the meridian of the English Bank. The quality of the bottom generally in this track is sandy, mixed with small stones; and the nearer you approach to the ridge of the English Bank, it is intermixed with bits of shells, and sometimes with clay or mud.

From lat. 35° 45′ S., due S. of the English Bank, a W. N. W. *true* course to lat. 35° 33′ S. will bring the Mount Video to bear true north, in about 6½ fathoms mud, at the distance of 13 leagues from Point Piedras: and from this position, the same true course may be made, to raise the land about Point del Indio, if bound up to Buenos Ayres; or N. W., or *more northerly*, to get sight of the Mount Video; having due regard to the set of current, up or down the river, that you may neither be horsed on the S. E. tail of the Ortiz Flats, nor on the western part of the Archimedes' Bank. The bottom above this, is soft mud or clay in the channels, fit for safe anchorage. In lat. 35° 30′ S., or thereabout, and due south of the Archimedes' Bank, or some miles further to the *eastward*, I have been told by some persons, they have had as little as 4 fathoms, *hard* ground.

Ships leaving Monte Video to proceed up to Buenos Ayres, must be very attentive to the lead; and the course steered across the river, must be very carefully regulated by the set of current at the time. If the weather be sufficiently clear, the Mount is the most sure guide, keeping it by an azimuth compass, on the *magnetic* bearing N. E. by N.; and when it sinks to an eye *in the top* a more westerly course may be steered to raise the land about Point del Indio. This direction is intended to apply particularly to frigates, or any ships drawing more than 16 feet water; because it is not adviseable *for them* to cross the tail of

the Ortiz flats much further to the *westward* than a true S. W. course from the Mount will take them; for with a *low* river, I have had barely 3¼ fathoms in the Nereus, with the Mount bearing N. 35° E. by compass, distant 10 leagues. At other times, I have sunk the Mount on a N. 53° E. magnetic bearing, and had as much as 3½ fathoms water; but the river was then well filled.

On the southeastern part of the Ortiz bank, which is *there* hard stony sand, there is still remaining (in 1813) part of a mast, or beacon, about 12 or 13 feet high. It is in lat. 35° 02′ 15″ S.; and 0° 45′ west of *Mount* Video; from which it bears true W. 14° S. 37 miles. There is about 12 or 13 feet alongside of it; 3 fathoms 2 miles to the eastward of it; but not more than 10 or 12 feet, as far as 3 miles S. W. of it. Point del Indio bears *true* S. 33° W. 16 or 17 miles from it.

To the distance of full 17 miles southeastward of the Ortiz Beacon, there is *generally no more*, and often *less* than 3½ fathoms; the bottom tough clay nearest the bank; and in some places farther to the *southeastward*, soft mud, not more than 3¼ fathoms.

After sinking the Mount about N. E. by N., and having 3½ fathoms, a W. S. W. course will raise the land (if the weather is clear) about Point del Indio, to the eye at the mást head; and probably you will not have more than 3¼ or at best 3½ fathoms. The Mount and the land near Point del Indio, are sometimes visible at the same time.

Point del Indio, is in lat. about 35° 16′ S. and 0° 56′ W. of the Mount Video, from which it bears true S. 63° W. distant 50 miles. There is little more than 3 fathoms at the distance of 10 or 11 miles off shore, when the river is in a *mean state;* farther to the southward, and off Point Piedras, there is only that depth 14 or 15 miles off shore. Very great caution therefore is required in approaching it, and a constant look-out should be kept for the land, as it is very low, and cannot be seen farther than 12 or 13 miles from the deck of a frigate in clear weather.

When the land is barely raised to an eye 19 or 20 feet above the surface of the water, a W. N. W. magnetic course wil lead along shore, between it and the south part of the Ortiz, which is distant about 14 miles from it; and between them there is *no where* more water than 3½, but mostly 3¼ fathoms. With a high river, I have had 3¾ fathoms: the nearer the Ortiz, the deeper the water.

In steering up W. N. W. with the land seen from the deck, if clear weather, you will have 3½ or 3¼ fathoms, (yet if the river is low, perhaps some casts of *three fathoms*.) and raise a remarkable clump of trees called Embudo, which are much taller than the rest, highest at the *west* end, and lie in lat. 35° 06′ S.

and in long. 1° 16′ 30″ west of the Mount Video, or 0° 57′ 30″ east of the cathedral of Buenos Ayres. At some distance to the westward of the Embudo trees, there is another clump about the same height, but these being highest at the *east* end, are sufficiently distinguished not to be mistaken for the *true* Embudo.

When in 3½, or 3¼ fathoms, the Embudo trees bearing by compass W. S. W., the S. E. end of the Chico bank will bear W. N. W. or thereabouts, 10 or 11 miles: you must now determine from the water your ship draws, the direction of the wind, and state of the weather, whether you will pass between the Chico bank and the shore, or between the Ortiz and the Chico.—I have passed up and down several times between the Chico and the south shore in the Nereus, lightened in her draft to 18 feet 3 inches, but I would never attempt it again from *choice*, now I am better acquainted with the middle channel between the Chico and the Ortiz, and have every reason to believe that the *middle ground*, some charts lay down in it, does not exist.

A ship not drawing more than 15 feet, may take either passage; and ought perhaps to prefer that to the southward of the Chico bank, particularly if the wind be well to the southward, as she might take her soundings from the *weather* shore, and keeping in somewhat more than her own draft, run up along it; and by not deepening above 3 fathoms, would ensure being to the southward of the Chico.

The S. E. end of the Chico bank, bears from the Embudo trees N. 32° E. *true*, distant 10 miles, and E. 9° N., 13 miles from Atalaya church. Its latitude *there* is 34° 56′ 30″ S. and long. 1° 09′ W. of the Mount Video. This bank runs in the direction of N. 52° W. true, or N. 65° W. by compass, about 13 miles to its N. W. end, which is in lat. 34° 48′ 50″ S., and 0° 47′ east of Buenos Ayres' cathedral. From this N. W. end in 14 feet water, Atalaya church bears S. 14° W., distant 11 miles: and Point Santiago, forming the Ensenada de Barragan, bears W. 4° N. distant 14 miles from it. The breadth of the Chico does not exceed 2 miles, or perhaps 1½ mile, and its *inner* edge is about 9 miles from the shore. The water between it and the shore is no where more than 3½ fathoms, and the deepest water is along the inner edge of the shoal, at the distance of half a mile from it, or less in some places. About midway between it and the shore there is 2¾ fathoms. On some parts of the Chico there is very little water, and within the limits I have assigned to it, no where more than fourteen feet. There *was* for some years, the mast of a vessel called the Pandora, which was wrecked on this shoal in lat. 34° 54′ S., about 5 miles from its S. E. end, which proved an excellent beacon to guide ships passing it on either side; but it has disappeared.

It is very necessary that *three* buoys should be placed on this *dangerous* shoal, to mark its centre and each end.

To ships drawing *less* than 15 feet, it is only further necessary to recommend care and attention on approaching Point St. Jago, which forms bushy and distinct; and when it is brought to bear to the southwestward, haul out into the stream of 3½ fathoms, to round outside the *Spit*, which runs about N. W. by compass from Point St. Jago at least 10 or 11 miles; its extreme point, in 2 fathoms, being about 5 miles from the shore. When two remarkable trees on Point Lara are brought to bear S. by E ½ E., or S. S. E. by compass, you are past the Spit. This mark will also lead a ship of that draft of water, clear to the westward of the Spit, in running in towards Ensenada.

After passing the Spit off Point St. Jago, in 3½ fathoms, a W. by N. northerly course by compass, will lead up to the outer road of Buenos Ayres, where any ship may safely anchor in the water she draws, if the river is low.

Frigates, or any vessels drawing more than 16 feet water, should barely raise the land about Point del Indio to the eye on deck, and borrow nearest the Ortiz: more particularly when the Embudo trees are brought to bear as far as S. W. by W. (magnetic;) for with the Embudo bearing from S. W. to S. S. W., the bottom is flat, off to *three fathoms*, full 7 miles from the the shore, and chiefly *hard* clay. Therefore, when the Embudo trees bear W. S. W. by compass, and you are about 9 or 10 miles off shore in 3½ fathoms, if you have a leading wind haul N. W. by W. or more northerly, as may be required to clear the S. E. tail of the Chico, and you will soon deepen your water to 4 fathoms, and more, in the middle channel, between the Chico and the Ortiz shoal. The fair course through between them, is *about* N. W. by. W. ½ W. (magnetic) and in mid-channel, the land can but just be distinguished from the quarter-deck of a frigate. When the Embudo trees bear S. 20° W. by compass, you will be abreast of the S. E. end of the Chico, and may either take your shoal soundings along its northern or outer edge, to about 3¾ fathoms, if the wind is southerly, or if the wind be northerly, or easterly, borrow into a convenient depth along the southern edge of the Ortiz.—I believe the breadth of this middle channel may be 5 or 6 miles, the depth of water from 4 to 5½, and even 6 fathoms in the fair way about the N. W. part of it, and abreast *that* end of the Chico. The quality of the ground all the way through this channel, is generally soft mud, fit for safe anchorage.

The N. W. pitch of the Chico Bank being passed, and the depth of water 5 or 5½ fathoms, you may steer by compass W. by N. ½ N., or W. by N. for Buenos Ayres, taking care not to shoal under 3¾ off Ensenada, till Point Lara Trees bear S. S.

E. A little more than half way from Point Lara to Buenos Ayres, there are two other remarkable trees.

When moored off Buenos Ayres, in the Nereus in 19 feet water, soft mud bottom, these trees bore by compass S. 17° E., the Cathedral S. 67° W., and the spire of the Recoleta Convent S. 76° W.: the lat. observed was 34° 34′ 30″ S. and the long. by the moon 58° 02′ W. of Greenwich, at the distance of 8 miles from the Cathedral. Variation of the compass 12½° easterly in 1813.

I have annexed a chart of Port Solodad, on Berkley's Sound, at the east end of Falkland Island. This chart was presented to the author in manuscript, by Captain John Galvin, of the ship Mercury, of Buenos Ayres, when he was in Philadelphia, in 1821, a copy of which the author had engraved for this work. Captain Galvin procured it from the captain of the French corvette Uraneé, which was at that time on a voyage of discovery, and was wrecked in this port, when captain Galvin put in there in the Mercury in a leaky state, in 1820. This information may be of importance to those who may have occasion to put in there, as it has been drawn from a late survey by the captain of the Uraneé, who settled the latitude of the entrance of that port, at 51° 40′ S. and long. 60° 40′ 20″ W. from Paris; and as Paris is 2° 20′ to the eastward of the meridian of Greenwich, it makes the long. 58° 20′ 20″ E. of Greenwich, and the variation of the compass in 1820, was 23° 30′ E. as observed on board the Uraneé.

Captain Galvin informed the author he procured a sufficiency of wild fowl, by shooting them, to supply his crew with fresh provisions, and very good. When captain Galvin arrived at that place, he found the ruins of a town but no inhabitants. There was plenty of fresh water, but no fire wood.*

The Pelew Islands were discovered by the Spaniards, in 1710. Their eastern limits are in lat. 7° 41′ N. long. 134° 55′ E. and their southwestern limits in 6° 53′ 30″ N. long. 134° 21′ E. according to Horsburgh.

Some of the old East India Directors lay down the longitude of the Pelew Islands nearly a degree too far to the westward; and indeed, in consequence of this error, some vessels have passed them to the westward, when they thought themselves to the eastward of them. I mention this as a caution to those who use the old directory. I strongly recommend to every captain bound to China, to take with him Horsburgh's East India Directory.

I passed within one and a half mile of Angoure, the southwesternmost of the Pelew Islands, in the ship William Savery, of Philadelphia, in 1819, when Angoure bore S. W. by W. distance two leagues, there appeared a reef projecting about half a

* See Thermometrical Navigation, p. 119.

mile from the low sandy point of Angoure, but as soon as this point bore north, this reef appeared like the surf beating on the shore, and no reef could be perceived. I passed within one mile of this reef. We had several of the natives along side in canoes, some of which came on board the Savery with as much innocence as a child would into its mother's lap, they are, as I am informed, a harmless and hospitable people. They had nothing to barter but cocoa nuts and fish. The wind being ahead, I made several tacks under the west part of these islands; they were bound by rocks and reefs apparently extending two leagues from the shore.

Gadd's Rock, or Cambrian's Reef. The shoal, called Gadd's Rock, or Cambrian's Reef, is no longer doubtful; lieutenant Ross, marine surveyor to the British East India Company, in the eastern seas, having examined it on the 9th of January, 1818, found it to be a small and very dangerous shoal, about 100 yards long; upon it the boat found two fathoms water, about the middle of the rock. It is situated in latitude 21° 43′ N. and when on with the highest part of Little Bottle Tobago Zema, it bears N. 2° W. by compass.

Bale of Cotton Rock.*—Brig Nelly at Calcutta, 1820, from the Isle of France, reported having seen the Bale of Cotton Rock, in lat. 5° 45′ N. and long. by lunar observation, 86° 49′ E. from Greenwich.

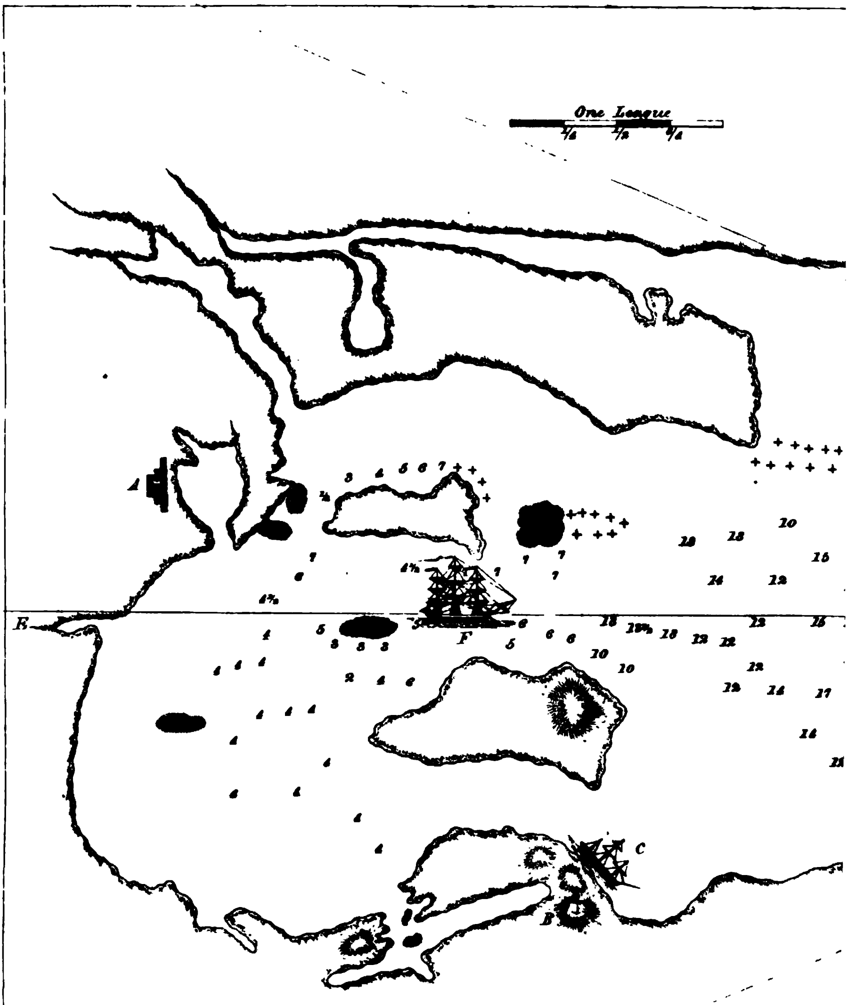
Remarks on the Palawan Coast.

By Lieutenant Daniel Ross, Surveyor to the British East India Company.

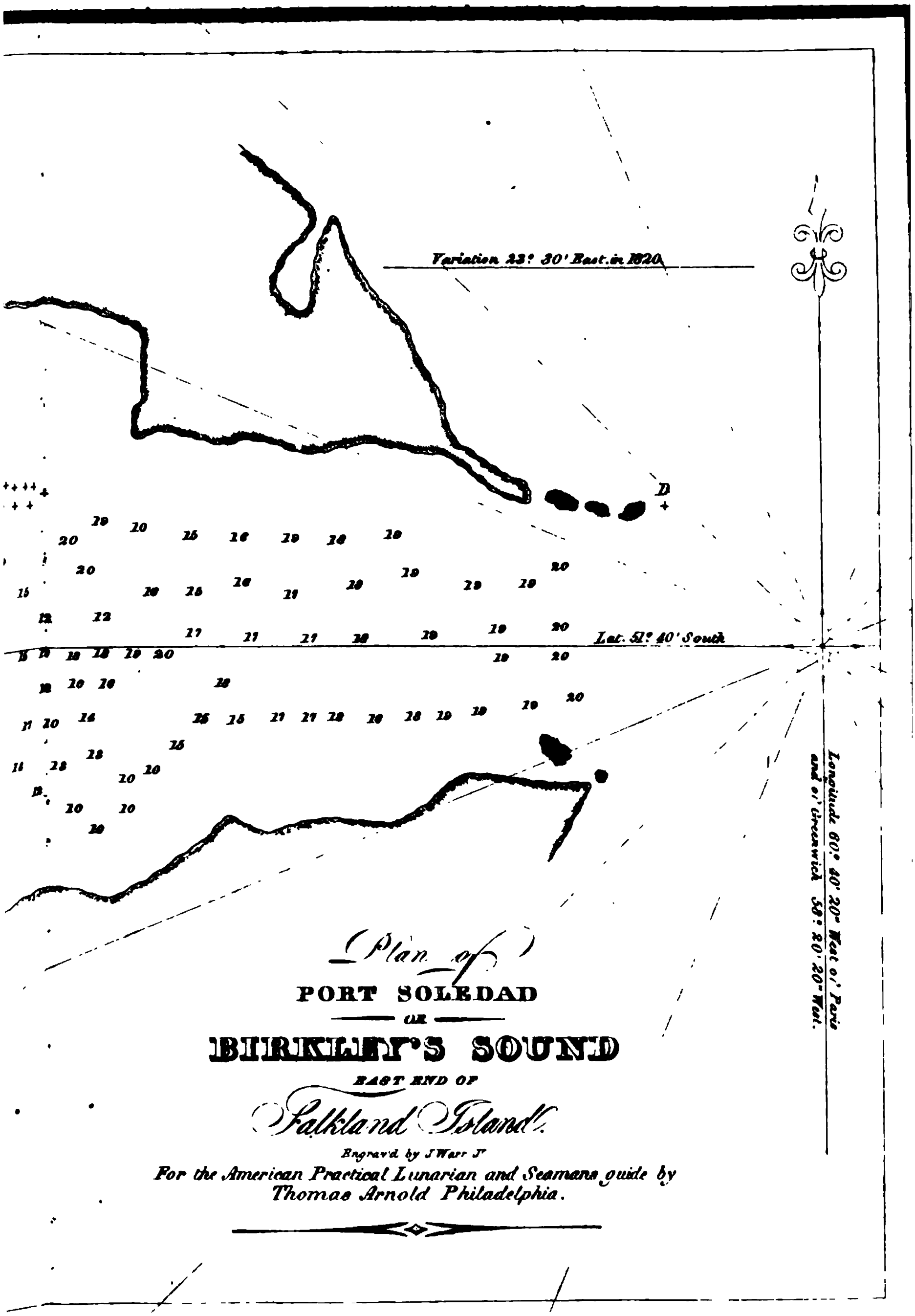
IN working or standing up the Palawan Coast, in lat. 8° 32′ N. do not stand one mile east of 117, and do not attempt to go to the eastward of that meridian until you are in lat. 8° 54′ N.: even then be cautious. In lat. 9° 3′ N. do not stand to the westward of 116° 45′ E., nor to the eastward of 117° 20′ in the same parallel of latitude.

From 9° 3′ N. to 9° 25′ N., do not stand to the eastward of 117° 20′ E., nor to the westward of 116° 56′ E. In lat. 9° 50′ N. do not stand to the eastward of 110° 18′ E., nor to the westward of 117° 30′. About lat. 10° N., you must keep a good look out for small rocky patches, having only 5, 6, and 7 fathoms water. From the latitude of 10° to 12° N., to the westward of 117° 30′ E., we are at present unacquainted of there being any danger.—This is all the information I can

* Extract from the United States' Gazette, Philadelphia.



A. Ruins of the town of S.t Louis.
B. Place of Observation.
C. Wreck of the French Corvette Urannei.
D. Sunken Rock which the Urannei struck on.
E. Fresh Water.
F. Anchorage of the Mercury.



Variation 23° 30' East in 1820
Lat. 51° 40' South
Longitude 60° 40' 20" West of Paris
and of Greenwich 58° 20' 20" West.
Plan of
PORT SOLEDAD
OR
BIRKLEY'S SOUND
EAST END OF
Falkland Island.
Engrav'd by J Warr Jr
For the American Practical Lunarian and Seamans guide by
Thomas Arnold Philadelphia.

give worth notice respecting this coast. And notwithstanding some ships have gone without these limits, I would advise you to keep within them; for the innumerable small patches, many even with the water's edge, that line the coast of Palawan, would be scarcely credited; and the lead giving but little or no warning.

Remarks on False Bermuda.

False Bermuda, is laid down in many charts in the same latitude as the Island of Bermuda, and about three hundred miles to the eastward of it. Observing that this shoal or sunken rock is omitted in many charts, and from circumstances believing such a shoal to exist, and is somewhere about the place as above stated, I subjoin the following fact.

About the year 1800, Captain Hampton sailed in a brig, I think she was owned by Robert Ralston, Esquire, of Philadelphia. Captain H. informed me that his vessel struck on something he supposed to be the False Bermuda. He was bound to Surinam, and when he made the land, he was confirmed in the opinion that he had struck on it—that he could not be so much out of his reckoning as to mistake it for rocks near the Island of Bermuda. From the many vessels from the United States bound to Surinam and Cayenne, which are missing, and this danger being in that route, I think it very probable that many vessels have been lost on it; so that it is best to be cautious in crossing its latitude near that meridian.

Directions for sailing into Cape Haytien, formerly called Cape Francois.

BRING Point Picolet to bear S. S. W.; then steer that course till all the western land is shut in, except the island of Tortudas; then haul up S. S. E. and steer that course till you open a small rock, which is close in with Point Picolet. As soon as a vacancy appears between this rock and the land, steer direct for the shipping in the harbour. In 1818, when I was there in the schooner Rampart, I found the above directions very correct. The flags which float in the harbour are sometimes blown down, which makes the above directions the more valuable. An English brig ran on the reef in going in, and bilged, the Captain of which told me, that if he had had the above directions, he should not have run on the reef. For the correctness of the above directions, I refer to Mr. Garrigues, of Philadelphia, to whom I am under obligations for this information.

Five Fathom Bank.

THE Five Fathom Bank, as it is called, stretches N. E. and W. about 10 miles in length. Nearly on the middle of the ık there is only 12 feet at low water, which deepens gradually vards each end, to about 5 fathoms. The shoalest part is ›ut one mile in circumference, and bears from the pitch of pe May about E. by S. ¾ S. by compass, distant 15 miles. ıe rise and fall of tide on this bank is 18 inches. It bears m Cape Henlopen Light House about E. by N. ½ N. per npass, distant 10 leagues. About the above place, the lead ght to be hove, standing off shore as well as on; for the nt of this precaution, the ship China, of Philadelphia, was t on that bank. She was standing off shore when she ground- . She was above one thousand tons burden, and was from tavia bound to Philadelphia. She drew 22 feet, and ground- in 18 feet water. The ship Pegu, drawing 16 feet, lost her lder on this bank. The brig Isabella had her false keel ocked off on it, and many others have struck on it. This oal breaks in a rough sea. The above description is from : testimony of more than thirty of the first rate Delaware ›ts; and my reason for giving it a place in this work is, that ıave not seen less than 18 feet water mentioned on that bank, any publication, whereas I myself passed over it, in a fog, 14 feet water, in the ship Orion, in 1803. The Orion was a light draught of water, otherwise she would have struck. e drew at that time but 12 feet 2 inches, and the water was ry smooth.

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*New South Iceland.**

THE Express, at Stonington, left at New South Iceland, bruary 26th, ship Esther, Low, of Boston, 7000 skins; ship Cain, Winship, do. 7000; ship Huron, Davis, New Haven,)0; brig Catherine, Henfield, Stonington, 9000; brig Jane ıria, Johnson, New-York, 8000; brig Aurora, Macy, 1000; g Charity, Barnard, 3000; brig Emerald, Boston, none; g Nancy, Upton, Salem, none; schooner Henry, Brunn, :w York, 3000; schooner Huntress, Burdick, Nantucket,)0; schooner Harmony, do. 3000.

The Russian frigate Wostock, Captain Hellenhausen, and a op of war, were at New South Iceland, in February last, a survey.

* From the New-York Mercantile Advertiser, May 4, 1822.

Captain Henfield of the Catherine, writes from New Shetland, February 11.—"We have been much mistaken about sealing in this country, as there is but little ground that the seals come upon; and a greater number of vessels after them than we supposed there would be. The country is a wild, cold, disagreeable mass of snow and ice; and its shores are very dangerous. In entering this harhour the ship Clothier struck on a reef of rocks, and was totally lost. The following persons belonging to the Catherine were drowned by the upsetting of the boat, at Falkland Islands:—Henry Perry, Thomas Pomroy, Nahum Haynes, and Cory Manchester."

A letter from Mr. Daniel W. Clark, mate of the brig Hersilia, of Stonington to the editor of the New Haven Journal; dated at Port Williams, New South Shetland Islands, February 18, furnishes the following information:

"We arrived at these islands on the 31st of October, after a pleasant passage of 85 days.

"We are now loaded with fur skins, having taken upwards of 18,000 of superior quality; but being anxious to obtain a second voyage before I return to the United States, we have agreed to send our voyage home by the schooner Express and brig Frederick, Pendleton, both of Stonington, then to proceed round Cape Horn into the Pacific Ocean, in search of a second cargo, which I doubt not will be obtained soon. As for getting another cargo in these islands it is utterly impossible, for there is scarcely a seal left alive. The country is full of vessels from most quarters of the globe, and I am certain that one half of them will not obtain half a voyage. Our being the first vessel in the country, and getting possession of the best ground, is the reason why we succeeded in a valuable cargo.

"There are now lying in this port twelve sail of American vessels: among the number is the ship Huron, Davis, of New Haven, who has made out rather indifferently. Where they are next bound I am not able to ascertain; but they, as well as ourselves, must push off soon, on account of the severity of the approaching season. There is scarcely a day passes without snow, hail, or rain, although midsummer with us; and ice makes every night. In truth it is a climate I am glad to leave. We have already had accounts of nine sail of English vessels being lost in these islands, and one American ship called the Clothier, from Stonington, Connecticut How many others are lost that we have no accounts of, God only knows.

"The brig Aurora, of New York, has lately arrived here. I understand she has been looking for these islands nearly two months.

"Perhaps the American dealers in fur skins have an idea that this country will be overstocked with skins, and that they will

be bought for little or nothing; but I can assure them they will be mistaken; for I am certain that at least six sail of American vessels will be obliged to seek for a cargo in some other parts.

"This harbour is in about 62° 30′ S. latitude, and 63° 5′ W. longitude. We have been as far south as 66°, and found land. How much farther the land extends I know not. It is entirely covered (except the low land and beaches where the seals come up) with snow and ice, at this season of the year, which is the middle of summer.

"DANIEL W. CLARK.

"*On board the brig Hersilia, South Seas.*"

CONTINENT OF NEW SOUTH ICELAND.*—We have been favoured with interesting particulars respecting a southern continent by Captain Nathaniel B. Palmer, of the sloop James Monroe, lately arrived at Stonington from the South Shetlands.

Captain Palmer proceeded in the James Monroe from the Shetland isles to the continent, and coasted it from abreast of the isles to the eastward, as far as 44° west long., keeping as near to the shore as the edge of the firm ice would admit. At some places he could coast along shore; at other parts he could not approach nearer the shore than from one to five or six leagues, owing to the firm and fast ice; although it was midsummer there at the time, being in November, December, and January.

In 61° 41′ S. lat., 45° 27′ W. long. from Greenwich, the coast was clear of firm ice, and here they discovered a fine harbour lying about one mile within the entrance of Washington Strait, which harbour was named Palmer's Harbour, where he came to anchor. He found not the least appearance of vegetation on the land, except the winter moss. Neither did he discover any animals only a few sea leopards, beautifully spotted. Of birds there were penguins, Port Egmont, or sea hens, white pigeons and gulls.

There is now no doubt that there exists a *southern continent*, and that Captain Cook's "Southern Thule" belongs to it. Captain Palmer could discern the mountains covered with snow in the interior as he sailed along the coast.

THE REEF of MANOEL LUIZ,† near Maranham, is one of the most dangerous and difficult to avoid. By official records it appears that 35 vessels have been lost on this dangerous shoal since the year 1814. This reef has lately been completely examined by Captain Roussin of the French navy, who has dicovered an error of five leagues in the chart of Arrowsmith. This reef is composed of a bank of pointed rocks, nearly of a conical

* From the New London Gazette, April 1822.

† Extract from the United States' Gazette, Philadelphia, Oct. 31, 1821.

shape, intermixed with sand, three miles long from E. by S. to W. by N., and half a mile from N. to S. These rocks are separated by greater or less intervals, in which there is from 8 to 12 fathoms water, whilst the points of the cones reach the water's edge. No breakers appear, and the vessel which runs upon them must sink almost instantly. The true situation of this dangerous spot, by repeated observations, is determined to be 0° 52'·20'' N. lat. and 0° 1' 30'' to the E. of the meridian of the fort of San Antonio de Maranham. Very nearly 26 leagues to the north from the point of departure all vessels take on leaving Maranham, and three leagues to the E. from the hill Itacolumi. The variation of the compass was found to be 57 minutes easterly.

Maranham, according to Bowditch, is in lat. 2° 25' S. and long. 43° 40' W., so that the reef of Manoel Luiz must lie in 0° 52' 20'' N. lat. and 43 38' 30'' W. long.*

George's Shoals.†

A Report, relative to the survey of George's Shoals, made in the United States' Schooner Science, and the Sloop Orbit, by direction of the Board of Navy Commissioners, and under the orders of Capt. Isaac Hull, in 1821.

There are properly four shoals on George's Bank; the whole of them included between lat. 41° 34' N. and 41° 53' 30'' N. and long. 67° 18' W. and 67° 59' W. Between them there is from 15 to 35 fathoms water.

The largest, and on which is the chief danger, is the most southerly and westerly. It is somewhat triangular, with a long and narrow spit making out from the S. E. angle. The S. E. point is in lat. 41° 34' N. and long. 67° 40' W. The west point is in lat. 41° 42' N. and long. 67° 59' W. The N. E. point is in lat. 41° 48' N. and long. 67° 47' W. The eastern side of this shoal, although somewhat irregular, runs nearly S. S. E. and N. N. W. having on it from three feet to nine fathoms at common low water. It is composed of a great number of sand spits, very narrow, so that the width of a narrow vessel will make several fathoms difference in the depth of water. The general range of the spits is from S. E. to N. W. As there are no rocks, they are consequently liable to change, in some measure, their positions and ranges. On the eastern edge, even in calm weather, unless it be high or low water, the tides run with great rapidity, and form considerable breakers when setting to the westward, and a large waterfall when set-

* Maranham is on the Brazil coast.
† Extracted from the Boston Evening Gazette.

ting to the eastward. This is accounted for, by a knowledge of the fact, that directly on the edge of this shoal there are from twelve to sixteen fathoms of water, so that the edge forms a species of dam, stopping the force of the flood tide, and over which the ebb falls.

When there was considerable wind, we observed that the breakers were higher within the edge, to the westward, than on the edge; and I have no doubt that the water there was still shoaler, and that we would have seen the sand, had it not been for the heavy sea. The breakers, were such, unless it were entirely calm, that it was impossible to go among them with boats; nor was it considered safe to attempt it with the vessels. For besides the danger of striking on the hard sand spits, the vessels would have been liable to be filled by the breakers. Even on the eastern edge, and at nearly slack water, the vessels were at times nearly covered with them. And it was not thought necessary to attempt it, as the objects of the survey, to ascertain if there was danger on the shoals, and the situation and extent of them, could be accomplished without risk.

Had not the sea been very smooth, and at high water, we should not have been able to have gotten on where we found three feet, reducing it to low water. The prevailing wind was to the eastward; and I have no doubt but that this place would have been bare with any continuance of an off-shore wind.

I think there are no rocks about the shoals. We had one cast on the S. W. side, which indicated rocky bottom, in fifteen fathoms, but I believe it to have been some sharp stone that the lead struck on, although I have marked it according to the appearance, on the chart.

The centre of the northern shoal is in lat. 41° 53′ 30″ N. and long. 67° 43′ W. It extends east and west four miles. The shoalest part having six fathoms, is very narrow and composed of hard sand. But there is not more than twelve fathoms of water for three miles south of the above latitude. On the north side, at two cable's length from the shoal, the sloop dropped into 33 fathoms. The breakers on this shoal are very heavy, and when there should be a sufficient sea to endanger a vessel, they might be seen some miles, and heard at a very considerable distance; and as the shoalest part is not more than a cable's length inside, and no danger near it, a vessel might avoid it.

To the eastward of the last mentioned shoal, in lat. 41° 51′ N. and long. 67° 26′ W. is another small shoal, with eight fathoms water, having however considerable breakers. There are but 17 fathoms for three miles north of it. But very near to the east of it, are 31 fathoms, and from 20 to 30 fathoms to the south and west.

The centre of the east shoal is in lat. 41° 47′ N. and long. 67°

19′ W. It is about two miles long from east to west, and has several fathoms water. To the south, there are but 17 fathoms for two miles. In other directions there are from twenty to thirty fathoms.

The above described shoals, I am confident, are all which are on George's Bank. Their positions and sizes may be relied on, as well as the places of the soundings which I have laid down on the Chart. They were ascertained by a vast number of celestial observations, taken with good and well adjusted instruments on board the two vessels—and very carefully and faithfully calculated. The rates of the chronometers were found by a transit instrument previously to sailing from Boston, and after our return, and all the observations re-calculated for the small variation which appeared.

At anchor at different places, and on different days, we determined the set and strength of the tides, and as nearly as possible their rise and fall. The rise of them is from one to one and a half fathoms. They set round the compass every tide, setting S. E. nearly, at full moon, and running from one to four knots per hour, at a mile's distance from the breakers. The mean rate, however, is materially varied by the winds. They set strongest at W. S. W. and E. N. E. and which is undoubtedly the strength of the flood and ebb. From these causes and variety in the tides, arises a principal danger in approaching the shoals. When under weigh about the shoals, in a few hours time we found ourselves drifted far out of our reckoning, and to ascertain our situations, when both vessels were under weigh, we took continued observations for the longitude by the chronometers, and at the same time double altitudes for the latitudes; which latter were calculated by Brosius's new and certain method. By allowing for the sets of tides, as ascertained at anchor, the observations and reckonings agreed very nearly; so that the latitude and longitude of every sounding placed on the Chart, may be considered as certain.

Should any vessel fall in with the shoals, a knowledge of the course and strength of the tides would be of the greatest importance. And they can be calculated for any day and hour by the preceding facts.

In going from Cape Cod to the shoals, at five leagues from the light, there are 86 fathoms, muddy bottom. The water gradually deepens to 133 fathoms; and then gradually decreases towards the shoals. In lat. 41° 51′ N. and long. 68° 11′ W. there are 90 fathoms. In lat. 41° 50′ N. and long. 68° 3′ W. there are 49 fathoms sand and gravel, on the western edge of the Bank. The water then shoals fast. To the northward of the shoal, in lat. 41° 59′ N. and long. 67° 52′ W. on the south side of the north channel there are 60 fathoms soft mud. In

lat. 42° 12′ N. and long. 67° 51′ W. there are 102 fathoms. In lat. 42° 10′ N. and long. 67° 18′ W. there is no bottom at 175 fathoms. To the eastward we did not ascertain the extent of the Bank. In two miles southward of the S. E. point of the shoals, there are from 20 to 26 fathoms of water, which soundings continue for at least 20 miles to the southward and westward.

The bottom on the bank, so far as we ascertained it, is of such a narrow character, that it is difficult for a vessel to ascertain her situation by it.—We often found a great variety of soundings in a very short distance; such as sands of various colours, and differently mixed, coarse and fine, gravel pebbles of various colours, stones, sponge and shells. Of all these, except sand, I saved a number of specimens, with marks to note the places where they were taken.*

Notwithstanding this variety, some general character of the soundings may be useful. To the westward of the shoals, and at some distance from them, the bottom is coarse sand and gravel of all colours. To the N. W. a mixture of white, black and yellow sand. To the north, black and white sand. To the N. E. chiefly gravel and pebbles.—To the east, fine white and yellow sand; and lat. 41° 57′ N. and long. 68° 40′ W. some white moss. To the S. E. fine white and yellow sand. As the shoals are approached, in whatever direction, the soundings become coarse, and are frequently mixed with shells of different kinds. Near the shoal much of the bottom is pebbles; and to the east of the largest and most dangerous shoal, there are stones of the size of hen's eggs, with moss and sponge on some of them. Near the S. E. point is from 15 to 20 fathoms, a prevailing character of the soundings is green shells, and chiefly of the species usually called sea eggs. If a vessel be far enough south to avoid danger, she will have no shells. The quality of the soundings, as far as we were able to survey the bank, will be best understood from the chart, where they have been carefully rated.

The time and weather prevented making a complete survey of all parts of the bank. And although we ascertained the boundaries of it to the westward and northward, I have not delineated it on the chart, being unwilling to borrow any thing from charts which disagree so essentially, and which we found very incorrect in the material point. Of the shoals themselves, I do not believe a more perfect survey can be made, unless in a calm time, the main shoal could be penetrated.

* It may be worthy of remark, that at one cast of the lead, on examining the arming, I found one third black sand, one third white, and one third green shells, in as distinct dimensions as they could have been drawn.

This, however, does not seem to be an object, as no vessel would be safe in attempting to pass over it.

The reports that rocks have been seen on the shoals, are undoubtedly incorrect. Had there been any there, we could not have failed of discovering them. At the west part of the bank, in strong tide rips, we saw large quantities of kelp and sea weed, which, at a distance, had the appearance of rocks. But on sounding, we found good water, and a regular and clear bottom.

It will be seen, by the bottom, that the holding ground is not good. But the vessels employed in the survey, by having a long scope of cable, rode out a considerable gale of wind, for twenty-two hours, on the east side of the main shoal, and to windward of it. At this time the sea broke very high in ten fathoms water.

C. FELCH.

Boston, Nov. 1, 1821.

ON

MANŒUVREING

A SHIP UNDER SAIL.

To tack a Ship.

TO tack a ship, let the sails be trimmed sharp, and every man be sent to his station; hands in the tops to bear the back stays abaft and abreast, to shift over the staysail tacks, &c. and let all the ropes be clear and stretched along upon deck; then put the helm down, and call out, *helm's alee*, *fore sheet*, *foretop bowline*, *jib and staysail sheets let go!* The wind out of the mainsail, *raise tacks and sheets!* and haul well taught the weather after-braces for a good haul. The wind about a point, or two points upon the bow, so as to back the weather leech of the main top-sail, *mainsail haul!* sharp round with the after-yards, and watch her way; if she has no way, right the helm; if sternway, shift it. The after sails full, *let go and haul!* round briskly with the head-yards, and trim all sharp.

REMARKS.

Should it blow fresh, be careful to set the back-stays up when in stays.

The practice of bracing to the head yards, while the ship has fresh way, is disapproved of, as tending to destroy it, thus losing the effect of the rudder, which is of more consequence: and the reason for hauling the mainsail with the wind upon the bow is, that the wind then taking aback the weather-leech of the mainsail and main topsail, causes the after-yards to fly round of themselves, bringing the clew of the mainsail flat aft to its proper place, that the people have only to run in briskly with the slack of the sheets and braces.

If the water be tolerably smooth, and the whole evolution be performed with spirit, the ship will seldom get stern-way, and will therefore require only the righting of the helm.

Should the ship after coming about fall off considerably, let fly the jib and fore staysail sheets, and keep in the head-yards till she comes to; then brace up, and trim sharp.

If it be expected, from there being much sea upon the weather bow, that the ship will not come about, it will be proper to haul down the jib and fore topmast staysail before the helm is put alee; and at all times when these sails are set, the officer forward should be particularly careful that the forecastle-men do not haul over their sheets too early, which they frequently are guilty of from an over anxiousness to be forward with their duty, and thus often prevent the ship from staying. While the helm is putting alee, let it be done gradually, and if the ship has quick head-way she will seldom require the helm to be put hard over to bring her about.

It sometimes happens that a ship will refuse staying even after the mainsail is hauled, and from that time fall off. In this case, haul up the mainsail, mizen, and mizen stay-sail; square the after yards, and keep the helm as it was, for she will have stern-way. This position of the sails and helm will cause her to fall off briskly upon her heel. As the after sails fill and she gathers head-way, shift the helm, and proceed as if veering.

To Veer a Ship.

To veer a ship, send the people to their stations; then haul up the mainsail, mizen, and mizen staysail; put the helm aweather; let go the after bow-lines, and square away the after yards. As she falls off, keep squaring the after yards, just suffering the after sails to be barely full. When the wind is nearly aft, raise the fore-tack and sheet; let go the head bow-lines, and square away the head yards. As the wind comes upon the other quarter, brace up the after yards; haul aft the mizen, and mizen staysail sheets; get on board the main-tack, and haul aft the main-sheet. As she comes to, brace up the head yards, and get on board the fore-tack; and when she is to the wind, right the helm, haul flat aft the fore-sheet, trim sharp, and haul out the bow-lines.

REMARKS.

The method of shivering the after sails is thought improper, as by tending to diminish the head-way, much of the effect of the rudder is lost.

To Box-haul a Ship.

To box-haul a ship, haul up the mainsail, mizen, and mizen staysail: raise the fore-tack and sheet, and man well the weather head braces and lee bow-lines; now put the helm aweather;

brace sharp aback the head yards, and haul out the lee bow-lines; then shiver the after sails, and keep them shaking as she falls off, which she will rapidly do by the position of the helm and sails. The wind aft and round upon the other quarter, brace up the after yards; haul aft the mizen and mizen staysail sheets; get on board the main-tack, and trim sharp the after yards. As she comes to, trim sharp the head yards, haul out the bow-lines, and right the helm.

To Club-haul a Ship.

Club-hauling is practised when it is expected that a ship will refuse stays upon a lee shore. To execute it, bend a hawser from the lee quarter to a kedge-anchor, prepared for letting go from the lee bow: now place the hands to their stations for putting the ship about, and let hands stand by the anchor; then put the helm down, and should the ship make a stand before she brings the wind ahead, let go the anchor and haul the mainsail. When the wind is ahead, cut the hawser, and the ship will cast the way required. The after sails full, let go and haul.

To make a Stern Board.

To make a stern board, haul down the jib and fore topmast staysail, luff the ship to the wind, and brace sharp aback the yards fore and aft; and when stern-way commences, shift the helm aweather.

The Manner of acting in a Squall.

The manner of acting in a squall depends so much on the moment, and on the judgment of the commanding officer, that it is difficult to prefix any precise rules. Every officer should remember, that all accidents which happen through his persisting to carry sail in a squall entirely appertain to himself. The vigilant seaman should ever be attentive to the weather; and if he sees any clouds arise which he has reason to suspect carry wind with them, let him make the ship snug. For instance: suppose the ship under a crowd of sail with a beaming wind, let the small sails, studding sails and spanker be taken in; and should the weather still continue to gather, and a hard squall be expected, let the topgallant sails be furled; the jib be hauled down, and stowed; the mizen topsail lowered down, and the lee clew-garnet of the mainsail hauled up: then place hands by the topsail haliards, and wait the expected wind. Should it come on to blow very strong, keep the ship off from the wind, and lower away the topsails; when, either reef or hand, as is thought necessary.

The Manner of acting when a Ship is brought by the Lee.

When a ship is brought by the lee, it is generally occasioned by neglect of the helmsman during a high sea and a quartering wind. Thus the careless helmsman, by yawing off the ship to leeward of her course, brings the sea upon the other quarter, which, striking the ship with violence, forces her stern round, and causes the wind to come broad on the opposite beam, throwing all the sails flat to the mast. Should the ship continue her way, she will, in all probability, recover her situation by the assistance of the helm, and brailing up the mizen and mizen staysail; but should she lose her way, it will be necessary to brace about the after yards, and even sometimes the head yards, to give her fresh way through the water, when she will veer; then trim as before.

To box a Ship off, and the Method of acting when taken aback.

If a ship is in the wind, through the neglect of the helmsman, or through the wind coming suddenly more ahead, by putting the helm aweather, and brailing up the mizen and mizen staysail, if she has headway remaining, she will fall off; but should the headway be at an end, she must be boxed off: to dô which, put the helm alee,—raise the fore tack and sheet,—brace sharp round the head yards,—and haul out the lee bow-lines: in this position of the sails and helm, she must inevitably fall round off upon her heel. The after sails being full again, brace about the head yards, right the helm, and trim sharp as before: *but should a ship be taken flat aback, or through neglect in not timely boxing her off, it should cause the wind to be broad upon the other bow, and it should be the wish of the officer to have her upon the same tack as before,* then put the helm over to that side which just before was the weather; brail up the mizen and mizen staysail: raise the main tack and sheet, and square the after yards. In this situation of the helm and sails, she will pay round off upon her heel; and when she has brought the wind aft, and gathered headway, shift the helm. The wind round upon the other quarter, haul aft the mizen and mizen staysail sheets, brace up the after yards, get on board the main tack, and haul aft the sheet. As she comes to, right the helm, and trim sharp as before.

Upon Lying to.

Lying to may be effected several ways. The art is to produce a balance between the head and after sails, so that their

effects shall counteract each other. When lying to is intended, the courses are generally hauled up, as being incommodious.

To Heave to under the Topsails.

A ship being close hauled under the topsails, mizen, mizen staysail and jib, it is required to heave her to. Thus situated, it is only throwing the main topsail to the mast, and putting the helm a little alee; but should the officer wish to prevent her from forereaching, let the mizen topsail be thrown sharp aback to the mast, and the helm be righted.

Another method is to throw the fore topsail square to the mast, and to put the helm a little alee; and should she forereach too much, let the mizen topsail be braced sharp aback, and the helm be righted.

REMARKS.

As a ship will forereach while she is laying to with only one topsail aback, she may be kept to the wind by the power of the helm; but with two topsails aback, she will sometimes go ahead and sometimes astern, therefore it will be improper to keep the helm either way. For this reason she must be kept to the wind by the assistance of the sails; and as the action of a sail is perpendicular to its surface, the main and mizen topsail being braced sharp aback must contribute a very great lateral force upon the ship's stern to keep her to the wind. Again, when the fore topsail is braced aback only square, it acts with no lateral power to pay off the ship's head, while the mizen topsail, by being sharp aback, keeps her to the wind. If the ship lies well to the wind, the jib had better be kept up in readiness to veer her.

In different situations, both the foregoing methods of lying to have their particular advantages. If a ship is to be brought to, to windward of another, the first method should be practised, as then she will be in readiness to fill and shoot clear of the vessel to leeward, should she drift too near her; but if the ship is to be brought to, to leeward of another, let the second method be practised, for, should the windward vessel drift too near, by bracing sharp aback the head yards, and shivering the mizen topsail, the ship will fall round off upon her heel.

Of Lying to in a Gale of Wind.

When a ship upon a wind is obliged to reduce almost the whole of her sails, through hard blowing weather, she is said to be lying to, and the more her bow can be presented to the wind and sea the better, as she will have less drift. The mode of effecting this, is as circumstances may require. If a ship is

to be brought to in a part where other vessels may be expected to be sailing in a contrary direction, the best sails to lie to under are, a reefed fore topsail, mizen staysail, and storm-mizen, with the helm so much alee as is found best to answer the purpose. The reason for not putting the helm hard alee, which is the usual custom, is this, that when the helm is hard alee she will come up in the wind and shake the sails, causing her to get stern-way, and fall round off. On the contrary, were the helm never put so far over as to oblige the ship to come up in the wind, she would come to and fall off much less: a ship thus brought to will be in readiness for veering in case of necessity. Where there is good sea room, a reefed mainsail, storm-mizen, and mizen staysail, are excellent sails to lie to under, as a ship will keep to the wind under these sails without much of the lee helm, and for that reason be very little subject to fall off or come to in any considerable quantity.

If the sea be extremely high, and the ship very stiff and labouring, she will lie to better under a main, and even a mizen topsail, which will prevent her rolling so rapidly by their lofty situation; and as the sails are much above the sea, they are not likely to be becalmed.

If a ship is to be brought to in those latitudes where a sudden shift of wind is expected, the course staysails are the best sails to lieto under, as then a vessel is in readiness for either tack, let the wind come as it may; and should one of these staysails be blown away, it will very little affect the ship.

REMARK.

The topsails are certainly superior to the courses for lying to under, as they can be readily braced about, and are much easier to take in. If topsails be used for this purpose, it will be found convenient to have a fourth reef, of such a depth as to admit the sail to be a taught leech, with the yard a foot or two off the cap; and as this part of the sail is intended for more boisterous weather than the rest, it must be made of stouter canvass.

Upon Reefing.

Reefing smartly depends upon practice, and stationing the people to advantage.

In blowing weather, taking in a reef is often attended with considerable time and labour, from not sufficiently spilling the sail. To get in a second and third reef, when blowing hard and sailing large, it will be necessary to clew up the sail, and brace it as much to the wind as possible, and to bring the ship to the wind in a small degree, if it can be done without hazard. Upon a wind, a second reef may generally be taken in without clew-

ing up the sail, but a third reef seldom. If the sail be not clewed up, the officer should be careful to haul the buntlines well taught, to prevent the sails flying up and beating the people off the yard. In reefing a course, the points are generally crossed over the head of the sail and round the yard; as the purport of this does not appear material, and as it takes up much time, when expedition is required, it had better be dispensed with.

Upon Scudding before the Wind in a Hard Gale.

As the wind is perceived to increase, and a gale of wind is expected nearly in the direction of the course, from the appearance of the weather and the latitude of the ship, all expedition must be made to prepare the vessel for scudding before the wind and sea. Let the reefs be taken in, and the sails be furled in time. Let the top-gallant yards and masts, mizen-topsail yard, mizen-gaff, and cross-jack yard be got down upon deck, that the ship may be as snug as possible. Let preventer-braces be rove for the lower yards, and let rolling tackles be hooked to all the yards, and bowsed well taught.

Should the sea run extremely high, there must be no dread of carrying sail, to give the ship as much head-way as possible, lest the sea should strike the ship with violence abaft.

The best sails for scudding under, are a reefed foresail, and double or close reefed main topsail; if these sails will stand the gale, there will be little danger of the masts.

As, in scudding, the safety of the ship depends upon good steerage, great care must be taken to have excellent helmsmen, a compass by the tiller, and careful people to attend the relieving-tackles, as, either through want of experience in the helmsmen, or the breaking of a tiller rope, the ship may be broached to, and many ill consequences follow. The officer of the deck should be careful to have the fore-sheets and preventer-braces clear, with hands to attend them; for should the helmsman broach to the ship by bringing the wind so much on either side as to touch the sails, the head yards must be immediately braced up: and should the tiller rope break with no relieving tackles hooked, or any accident happen to the tiller, the after yards must be braced up, the foresail taken in, and the ship hove to under the mizen stay sail while the mischief is repairing.

Upon Steering.

As a compass suffers much agitation from the motion of a vessel, and does not return sufficiently quick to its parallelism to point out the absolute position of the vessel's head, good

steerage requires further assistance, which depending upon a quick sight and nice judgment, is the reason we meet so few good helmsmen.

The helmsman must not pore over the compass, but alternately watch the compass, and the motion of the vessel's head passing the clouds, the sea, or any other objects more fixed than the compass, which may happen to present themselves to view. In blowing weather, if one person can manage the helm, the feel of it in his hand is a nice criterion of judging whether the vessel be coming to or falling off; so also is the greater or less noise or whistling of the wind. As the vessel comes to against the helm, it will feel heavier; and the wind coming more forward will appear stronger: on the contrary, as she goes off and gives way to the power of the helm, it eases in the hand; and by the wind's drawing aft, it appears to lessen. These circumstances, to an attentive and nice observer, mark the motion of the vessel sooner than the compass.

Upon Veering under a Mainsail and Fore Topmast Staysail in a Gale of Wind.

To veer under a mainsail and fore topmast staysail in a gale of wind, watch the ship's falling off, then put the helm aweather, ease off handsomely the main sheet, and gather forward the lee main tack. The wind abaft the beam, let go the main bowline, and round in the weather main brace. The wind aft, haul down the fore topmast staysail, square the head yards, brace up the after yards, and haul on board the main tack. The wind upon the quarter, set the mizen staysail, and haul aft the main sheet. Be careful now to moderate the ship's coming to, for should she meet a powerful sea with considerable head way, it may prove extremely destructive. The ship to the wind, haul out the main bowline.

REMARKS.

The reason for not squaring the main yard till the wind is abaft the beam is, that the weather part of the mainsail, when the yard is braced up, being situated before the centre of gravity, acts with considerable force to pay off the ship's head. For making the weather part of the sail of greater service, the following method is sometimes practised: bend the end of a stout rope to the slings of the main yard, then lead it down before the mainsail to the topsail sheet bits, and let it be hauled well taught and belayed; thus when the main sheet is eased off, the weather half of the sail will not lose any of its power to veer the ship. Let a hand stand by the rope to let it go when necessary.

In a very high sea it will be attended with danger to veer under a mainsail only, as by the ship's falling off and not quickly gathering head-way, she is liable to be overtaken by the sea, which may break on board her with considerable violence. In this case the fore topsail should be set, which may be taken in when the wind is abaft, or as convenient.

Upon Checking a Ship round in a Tide's Way with a Kedge Anchor and Hawser.

The practice of checking a ship round in a tide's way is more necessary in large ships, which are longer in performing their evolutions, than in small. For this purpose a boat with a kedge anchor and crew should be in readiness to run out a hawser upon either bow or quarter, as may be required. Let us suppose that a large ship is standing over to the shore under her topsails, and it is thought there is not room for her to come round in before she will be on shore. In this case, hand the end of the hawser into the boat from the weather quarter, bend it to the anchor, and pay down a good quantity into the boat; then put the ship in stays, and send the boat round the stern to let go the anchor. When the anchor is gone take a turn with the hawser, and the tide will presently hustle the ship to windward; taughten the hawser and bring her about: then trip the anchor, unbend the hawser, and haul it on board. Should it be required to veer the ship, let the hawser be handed into the boat from the weather bow, and let the boat be pulled round the bow, and the anchor be dropped to leeward; thus the tide hustling the ship to windward, will taughten the hawser, and veer the ship round, bringing the wind upon the other quarter; then trip the anchor, and haul in the hawser.—It will be necessary to veer away the hawser as it taughtens, to prevent its being broke by too sudden a check.

Upon Drifting to Windward by the Tide.

Where there is not sufficient room to work in a tide's way, a ship is under the necessity of drifting, the art of which is to keep the ship in the fair way, and at the same time to manœuvre the sails in such a manner as will least prevent the ship from driving.

If the wind is directly against the tide, and the channel is sufficiently broad, the ship should be drifted broadside to the wind, as the tide will then have the greatest power to drift her; and could the ship be backed astern, or shot ahead at pleasure, she might be kept drifting upon the same tack with safety; but it happens, that ships will never back so far astern as they will

shoot ahead. At the first of the stern-board a ship will go briskly astern, but will soon fall off and drift, with the wind abaft the beam, forging ahead; for this reason she must be drifted with the helm alee. It follows, as a ship will shoot more ahead than she can be backed astern, that in time she will arrive at the opposite shore, when she must be stayed or veered, and drifted upon the other tack. If she is to be stayed, (which certainly has the preference, as less drift will be lost by it) let the sails be filled in time, to give the ship sufficient head-way to bring her about; then put the helm alee. Should she come about, the sails and the helm having now their proper position for a stern-board upon the other tack, need not be touched till her stern-way ceases, when the helm must be shifted alee, and the head yards be squared to prevent her falling round off; but should the ship refuse stays, which is often the case,* then brace sharp round the head yards, and box-haul her, by which method she will lose much less drift than by veering. If there is not room to give the vessel way to stay or veer her.

If the ship now drifting broadside is approaching a narrow channel where it would be dangerous drifting in this position, she must be veered and dropped stemming the tide. In this case, that the drift may be as much as possible, it will be necessary to take in sail, and reduce the ship's head-way till she has only steerage-way left; thus a vessel may be dropped through a fleet of ships at anchor without danger.

Should the wind be a little across the tide, a ship may be easily drifted in the fair way, with her head towards the weather shore; for thus it will be found that she can be backed and filled at pleasure, and generally be drifted with the sails shivering, in which position they oppose least power to prevent the drift.

It frequently happens in serpentine rivers that the tide sets across, in this case the ship must be drifted with her head to the side from which the tide sets. These sets are readily discovered by observing the opening and shutting of two objects in the direction of the channel.

* In a straight regular reach the tide runs strongest in the centre, and gradually diminishes till within a small distance of the shore, where the water is either slack or runs counter; of course, a vessel sailing across such a reach, upon a weather tide, after having passed the middle of the reach, will have the tide stronger under her lee quarter than the lee bow, which will very much impede, if not entirely prevent her coming about; and should her head have arrived in the eddy water, while the tide yet continues to act under her lee quarter, it is impossible she can stay. In irregular serpentine rivers, counter tides and eddy waters are met with at different distances from the shore: for want of proper attention to this circumstance, vessels are often run aground.

Upon Kedging, or Drifting in Calm Weather by the Tide.

To drift a vessel by the tide in calm weather, a boat with a kedge anchor and hawser must be in readiness to attend. The vessel is to be kept stemming the tide by the assistance of the boat ahead, and when it shall be required to check, or steer the ship to either side, drop the kedge, and gradually check the ship; thus, by the waters being made to pass her, the helm becomes of use to sheer her as required. It is necessary that smart hands be placed to veer away the hawser on board, lest by a sudden check it should be parted. When the ship has got a sufficient sheer, trip the anchor, and haul on board the hawser, which coil away in readiness to run out again. The London pilots are extremely expert at this manœuvre.

Upon Trimming the Sails.

It is necessary all sails should be trimmed, to stand as taught as possible. The more a sail is made to approach a flat surface, either by or before the wind, the better: the notion that there should be a reef of slack canvass let out when sailing large is ridiculous. It is likewise necessary the sails should be balanced fore and aft, that the helm may be carried a-midships, for nothing can be more absurd than a ship's carrying a large spanker with a turn and a half of weather helm. If the helm cannot be eased by setting head sail, the spanker should be taken in when she will be more under command, and sail faster; for the force of the water against the rudder in the direction of the stern, is greater than the direct effort of the spanker which obliges it to be kept in that position; therefore by taking the spanker in, and thus suffering the ship to carry her helm a-midships, she certainly will sail with greater velocity. The sails that will most tend to counteract the spanker when the wind is abaft the beam, are the lower and topmast studding-sails set forward: these sails standing out considerably from the ship, act with a length of levor to pay off the ship's head.

If the wind is abaft the beam, the after yards should be braced more up than the head yards, that the wind may fill the head sails.

A Vane does not shew the absolute Direction of the Wind when sailing obliquely to it.

On board a vessel sailing obliquely to the wind, a vane does not shew the absolute direction of the wind, but a direction

compounded of the vessel's way and the velocity of the wind. By the vane, a ship will appear to be lying about four and a half, or five points from the wind; but if she is put about it will will probably be found that the two courses differ by thirteen points, which shews that the ship was six and a half points from the wind, when by the vane it appeared to be about five.

A Ship will not always sail the faster for more Sail.

It does not always follow that a ship will sail the faster for setting more sail. For instance, let us suppose that a ship in good trim is gliding along perfectly easy at as great a velocity as she is accustomed to sail with.

Now if after that, another sail should be added, the trim of the ship will be altered for the worse, which will impede her sailing.

Upon taking bad-sailing Vessels in Tow with the least Detention.

In convoys, where it is found necessary to tow, it ought only to be practised when the wind is steady, and the water tolerably smooth, as the loss arising from taking in tow, breaking of hawsers, and probable mischief to each other, is more than will be otherwise compensated.

If the water be tolerably smooth and the wind moderate, a vessel may be taken in tow without shortening sail or altering the course. For this purpose, let the tower situate herself half à cable or more, ahead of the tow, adapting her sail to preserve that position; the tow at the same time just steering to windward of her wake. Thus situated, the tow is in readiness to receive under her lee either a buoy or boat, with a small rope to haul the hawser or tow-line on board. A boat is certainly preferable, if it can be hoisted in without detention; but should it blow fresh, the ships must haul the wind, and place themselves in the above position; thus they can reduce their head-way, and back and fill at pleasure. If the ship to be towed is disabled in her rigging, it may be found necessary to heave to. If so, the tower must heave to upon the weather bow of the tow, otherwise, the hauling the tow-line on board will cause both ships to fall off from the wind before it be properly fast. The size of the tow-line should be adapted to the weather;—ships had better be asunder than tow with a heavy hawser in light winds. A small rope is sufficient at these times, being careful to haul or heave a larger on board as the breeze freshens, which can be done without detention.

Upon Sailing against a Sea.

Making sail against a head sea is attended with considerable danger, particularly if the sea be short; thus when one sea has passed abaft a vessel's midships and depressed her head, she will be met by a second before her head has risen, which will shock and pass over her with a force expressed by the square of the united velocities of the ship and sea; therefore, by reducing the headway, it will diminish the power of the waves. If this be accomplished by taking in the square sails forward, it will also prevent her pitching so deep into the sea.

It is a custom when a sea is seen coming upon the bow to put the helm down, and thus cause the ship to meet it. This practice, I should imagine, must have arisen from its relieving the person who is steering from the weight of the helm, which is greater as the sea passes aft and strikes the rudder; for it is attended with the expressions, "*Ease her, ease her!*" but it does not appear that the pitching is in the least prevented: the helmsman being eased of his burthen, it is concluded the ship suffers a general relief. However it has the advantage of easing the rudder, from the sudden jerk of the sea, and prevents the ship being thrown off from her course; but if a towering sea is observed coming upon the beam, it would be the height of imprudence to put the helm down; rather put it up, and thus diminish the force of the wave by running from it.

We cannot conclude this chapter, without particularly advising the practice of keeping the people to fixed stations. By frequent custom, the evolution becomes familiar. Therefore let station lists be made out for the principal manœuvres; as tacking, veering, furling sails, reefing, and heaving up the anchor.

ON COMING TO AN ANCHOR.

When a ship is coming to an anchor, she should always be under easy sail, as the topsails, jib, and fore topmast staysail, mizen, and mizen staysail.

To bring a Ship to an Anchor with a Side Wind, where there is no Current.

To bring a ship to an anchor with a side wind, where there is no current, let the sail be reduced to the topsails, and when she shall be within a few ships' length to leeward of her anchoring birth, put the helm alee, haul down the jib and fore topmast staysail, clew up the fore and main topsails, and throw the

mizen topsail sharp aback to the mast. When she has stern way, let go the anchor, right the helm, and give the ship the necessary cable; then send the hands up to furl the sails.

To come to an Anchor with the Wind aft, where there is no Current.

When coming to an anchor, with the wind aft, where there is no current, if the ship has fresh head way, it will be proper to take in the main topsail while the ship is yet in the offing. The anchoring birth being fixed upon, steer the ship to a small distance on one side of it: when nearly abreast of the anchoring birth, put the helm hard over, haul out the mizen, and haul aft the mizen staysail sheet, to luff the ship smartly to her situation; clew the fore topsail up when it shakes, brace sharp aback the mizen topsail, and let go the anchor when the ship has stern way.

REMARKS.

Should it blow hard the ship must be made as snug as possible while in the offing. All sails that can be spared should be furled, and topgallant yards got down. Both the bower cables must be ranged, or the best bower and sheet, and great care taken that every thing be clear about the anchors.

In seeking out an anchoring birth, attention is to be paid to the buoys of the ships at anchor, lest their cables be overlaid.

To come to an Anchor without tending.

It sometimes happens that a ship is to be brought up in a place where there is not sufficient room to tend her. In this case reduce her head way as much as possible, before she comes to her anchoring birth.

To come to an Anchor upon a Weather Tide.

To come to an anchor upon a weather tide, the ship should be so steered as to be brought to her birth stemming the tide, and shot ahead of her anchor.

To come to an anchor upon a Lee Tide.

To come to an anchor upon a lee tide, the ship must be brought to her situation, if possible, upon that tack which will most admit her head stemming the tide, in order to bring up with greater ease. Should it blow hard, and the tide be strong, the square sails had better be furled while the ship is yet in the offing, and the ship be run into her anchoring birth under the

staysails. When the ship is arrived at her intended situation, put the helm alee, haul down the fore topmast staysail, and set the mizen and mizen staysail, to bring the ship rapidly to the wind; then let go the anchor, before she loses her way and falls off from the wind.

Upon this occasion, both bower cables, or best bower and sheet, should be ranged and bitted, in case of parting. If the first cable be not thought good enough to bring the ship up, when about a third of it is out, let go the second anchor, and veer away upon both cables. This anchor must be hove up before the ship tends for the weather tide.

When a ship is expected to bring up extremely hard, it is an excellent plan to range the cable, and bit it to the foremost bits, then to haul up a second range, and bit it to the after bits, that the cable, thus doubly bitted, may be wore away with ease. Great care must be taken that the after part of the second range be abaft the after part of the first.

To let go all the Anchors to the best Advantage.

When it is found that a ship cannot clear the shore under her lee by sailing, owing to the strength of the wind and the height of the sea; the last resource is to come to an anchor with all the anchors in the best position. For this purpose, let the cables that are bent be got clear for running. Then furl all the square sails with as much expedition as possible, and shoot the ship along the shore under the staysails. When the square sails are furled, let go the weathermost anchor, and veer away briskly the cable, then let go the next weathermost, and so on, till all the anchors are gone, nearly in a line along the shore; thus, when the ship becomes wind rode, all the cables may be made to bear an equal strain, and are separated from each other.

ON KEEPING A CLEAR ANCHOR.

The art of keeping a clear anchor is thought to be a difficult branch of seamanship, but I believe only from its being so seldom practised by the generality of seamen, particularly by those who sail long voyages; those seamen not being often in a tide's way at single anchor without having a pilot on board, whose duty is to tend the ship at high and low water.

Upon the Nature of Sheering a Vessel to one Side of her Anchor.

If the side of a ship at anchor is presented to tide by any means, the water will act upon her two ways, one in the direc-

tion of her keel, the other in the direction of her beam, which last will cause her to sheer out to one side of her anchor, which before was ahead. Suppose, for example, the power that presents the ship's side to the tide was a spring from the anchor coming in aft on the starboard side; upon heaving in the spring, the ship will sheer over to port, and bring the anchor upon the starboard bow. The more the spring is hove in, the more the ship will go ahead and over to port, till her side makes an angle with the tide of 45 degrees, when she will be the farthest over from her anchor that she can go; and if the spring is hove in after this, the ship will return, and be in the stream of her anchor when she is hove round broadside to the tide. Now if the helm is put over to starboard, it will act the part of the spring, by forcing the ship's stern to starboard, and thus by causing the water to act upon her starboard side, the ship will be forced over to port: and if the helm had been put aport, the larboard side would be presented to the action of the water, and the ship would go over to starboard: but the power of the rudder being according to the strength of the tide, which strength lessens upon the rudder as the ship sheers obliquely to the stream, it can never produce so great an effect as the spring.

REMARKS.

It should be a practice to shoot a ship, if it can possibly be done, on the same side of her anchor at each change of tide, that the danger arising from the anchor's not turning as the ship swings may be avoided; for should the anchor not turn in the ground, the cable will get foul about the upper fluke or stock, and either trip it out of the ground, or damage the cable. It often happens, when an anchor is tripped out of stiff ground, that it will not take hold a second time without the upper fluke should cant down; for the quantity of clay that adheres to the fluke prevents its digging into the ground afresh, so the anchor keeps tripping over the surface, and another anchor must be let go before the ship can be brought up.

As a ship by being sheered presents one bow to the tide, if the wind is directly against the tide, it must blow upon the opposite quarter.

To Tend a Ship for a Weather Tide.

Let us suppose a ship riding at single anchor upon a lee tide, with the wind in the direction of the tide, and that it is required, upon the tide's setting to windward, to tend the ship clear of her anchor. For this purpose, when the weather tide sets, and brings the wind broad upon either bow, hoist the jib and fore topmast staysail with the sheets aft; and if there is little wind,

brace full the yards, and set the main topmast staysail to shoot the ship a taught cable from her anchor. Now put the helm alee, and wait till the tide sets the ship over to windward of her cable, the buoy coming upon the same side that the helm is put over to; after which, should the wind blow so fresh as to shoot the ship end-on with the cable, brace to the head yard, and keep the after yards full to assist the helm. If from little wind the buoy bears nearly abeam, the jib and fore topmast staysail may be hauled down; but if the wind blows fresh, and shoots the ship nearly end-on with the cable, bringing the buoy upon the quarter, it will be necessary to keep the fore topmast staysail up, as in this situation the ship will be in danger of breaking her sheer against the helm, and the fore topmast staysail will be in readiness to catch her before she can fall to windward of her anchor. As the weather tide slacks, the ship will gradually fall wind-rode, when haul down the fore topmast staysail and right the helm; and should it blow fresh, let the yards be braced forward, and the ship be given the necessary cable.

To Tend a Ship with the Wind a few Points across the Tide.

Let us suppose a ship, riding lee tide with the wind two or three points upon the bow, is to be swung for a weather tide. When the lee tide is done the ship will become wind-rode, of course must swing with her head to the weather shore. As the tide makes to windward and brings the wind broad upon either side, hoist the jib and fore topmast staysail with the sheets aft, to shoot the ship a taught cable from her anchor. If there is little wind, let her be assisted by the main topmast and mizen staysails, and filling the yards. When the tide has set the ship over to windward of her cable and thus brought the buoy upon the lee side, put the helm alee, haul down the jib and fore topmast staysail, and if it blows fresh, brace to the head yards and fill the after yards, in which position she will lay quiet the remainder of the tide. As the weather tide slacks, the ship will shoot end-on with the cable, and gradually fall wind-rode, when, should it blow fresh, let her be given the necesssary cable before the lee tide makes strong, and the yards be pointed to the wind.

To Tend a Ship with the Wind across the Tide.

When the wind is across the tide, the simplest method of tending a ship is to keep her both tides to leeward of her anchor. At each slack water the ship will become wind-rode, and as she tends, and brings the wind on either side, put the helm aweather, and hoist the fore topmast staysail with the sheet to wind-

ward, to force the ship a taught cable from her anchor. When the tide is set, and the ship upon a proper sheer to leeward of her anchor, the fore topmast staysail may be hauled down.

On Keeping a Clear Anchor in calm Weather.

In calm weather, when assistance cannot be given to a ship by sail to keep the cable clear of her anchor, but she is in danger of falling over it, or on the wrong side; then, as the tide slacks, let the cable be shortened in, easing the helms as the ship comes to the anchor.

REMARKS.

It should be remembered that, to sheer a vessel, it is not always necessary to put the helm hard over, (for by this means, in a strong tide, she may be sheered adrift) but adapt the helm to circumstances.

It will not be always necessary to make use of the yards in tending a ship to shoot her a taught cable from her anchor. In general, the jib, fore topmast staysail, and main topmast staysail will be quite sufficient for this purpose.

Should the wind shift at any time, it will be necessary to alter the sheer of the vessel accordingly.

If there is the least suspicion of the ship's having come near her anchor, it should be sighted the first opportunity.

There are road-steads where an anchor will so completely bury itself, that the bight of the cable can never foul it. In such places it would be better, should there be room, to lay at single anchor than to moor.

At single Anchor, when to let go a second Anchor.

In a tide's-way, at single anchor, a second anchor should never be let go, but when absolutely necessary; for with a long scope of cable, a ship will ride more easy than with a shorter scope upon two cables. Further, should a vessel happen to drift athwart hawse in a gale of wind, there will be only one cable to cut: but how dreadful is the situation of that vessel which has cut from two anchors, and probably not another remaining at her bow!

If your ship should be in the hawse of another, it will then be necessary to drop a second anchor under foot.

REMARK.

When riding in a gale of wind, the deep sea-lead should be kept overboard, and often attended, that the officer may be assured the ship rides fast.

Upon Veering away Cable in a Gale of Wind.

Veering away cable in a gale of wind requires great precaution. Should it fortunately be bitted,* the cable may be wore away with considerable ease; but if not, before the stoppers are taken off, let the cable be put over the bit-head; thus, when the stoppers are taken off, and the cable taught about the bits, it may be wore away with as much ease as by bitting the cable to both bits.

Upon Mooring, &c.

It should be a rule to moor in a road-stead with the best cable and anchor to that quarter where the strongest wind and the highest sea are expected from; but in rivers, or in a tide's-way, where freshes are expected, the best anchor and cable should be layed to the ebb.

To Moor in a Tide's-way.

Let us suppose a ship is about to be brought up at high water, and it is intended to moor with the best bower to the ebb. In that case, she should be brought up with the best bower, and the cable stoppered till the ebb makes strong; then veer away two cables, and if it can be done, assist her astern with the mizen topsail. If, when the two cables are out, and the ship in the stream of her anchor, it is thought when moored she will ride too near any particular vessel, sheer her over from that vessel, and let go the small bower anchor. Now ship the capstern bars; bring to the best bower; veer away the small bower; and heave in the best bower to the whole cable-service; then stopper the cables and bit them, remembering to leave sufficient service within board to freshen hawse.

To Moor with a Swivel, half a Cable each Way.

To moor with a swivel half a cable each way, hang the swivel over the bows and bend to it the cable which is intended for the long bridle from the outer hawse-hole. The first anchor being let go, veer away to a half-cable, and lash the middle of the cable in the form of an eye, to which eye lash the swivel, and veer away upon both bridle and cable till the inner end of the cable can be got at to bend to the second anchor. The second anchor being let go, heave up to the swivel, and bend a short bridle from the other side of the stem, to guy the swivel amidships of the hawse. It will be necessary to have a good

* It should be a practice at all times, to have the cables weather bitted, so as to be able to veer out cable with more ease, in case of sudden gusts of wind.

buoy-rope to one of the anchors, to unmoor with:—this had better be slightly stopped along the cable, so that its end may be got at by under-running the cable, which will put it out of the way of being stolen.

To Moor with an open Hawse to any particular Quarter.

To moor with an open hawse to any particular quarter, let us suppose, for example, the road-stead, or river that the ship is to be moored in, to lie north and south, (in which direction the anchors are to be laid) that she carries her best bower on the larboard side, and it be requested that when moored, the ship shall have an open hawse with her head to the eastward. In this case the best bower must be the northern anchor. But if the hawse had been required to be opened where her head was swung to the westward, the best bower must have been the southern anchor.

Of Keeping a Clear Hawse.

When a ship is moored, many officers think themselves in so perfect a state of safety, or their minds are so much employed about the taking in or delivering the cargo, that the keeping the hawse clear is too much neglected.

If the hawse is clear, the ship must ever swing with her stern to the side the headmost cable leads of: if she swings contrary to this, she will make a cross; if she swings a second time wrong she will make an elbow; and a third time, will make a round turn, in which situation it will be impossible either to heave in or veer away cable, let the case be ever so urgent.

If, to keep the hawse clear, the ship should swing with her stern to windward, it will be impracticable to get her the right way by any sail that can be set; for as the tide slackens she will naturally fall wind-rode, and when the tide sets, it will take her upon the wrong side: however, if the wind continues, she cannot foul her hawse any more, as at the next tide the same wind will undo the cross it caused. When the wind is either ahead or astern, by the assistance of the mizen topsail or jib the ship can generally be made to swing the right way, provided the tide does not alter its direction as it ceases to run. For example, let us suppose the wind ahead, or even a little upon the starboard bow, and that the ship's stern is to swing to starboard: in this case, set the mizen topsail with the starboard yard-arms braced forward; haul out the starboard bowline;

hoist the jib, with the sheet to windward; and before the lee tide is done, put the helm to starboard to give the ship a sheer, which will be preserved by the position of the sails. Now watch the tide, and at slack water shift the helm: thus when the tide makes, it will act against the larboard side of the rudder and stern, and very much assist to swing the ship the right way. Again, should the wind be astern and a little upon the wrong quarter, if the helm be attended as before directed, and the mizen topsail braced full the right way, in all probability the ship will swing as required.

However, should this attending to the sails break the people too much off from their necessary duty, if the helm only was properly regarded it would often save the labour of clearing the hawse.

REMARK.

It will be proper at all times to have a rope and small anchor in readiness abaft, to run out and haul the ship round in calm weather.

Upon Clearing Hawse.

Clearing hawse can seldom be attempted when the ship does not ride by the clearing cable. To execute it, bend a fish-hook to a rope prepared from the bowsprit end. Now hook the cable the ship is riding by, below the turns in the hawse, and bowse it well up out of the water; then lash the cables together at the lower part of the turns. If the cable by which the hawse is to be cleared leads on the starboard side, send the larboard fore or foretop bowline into the hawse hole under the cable; or under and over, according as the cable to clear with is either below or above the other, which must be bent about three fathoms within the hawse. Then send in the starboard bowline, which let be bent well in towards the end of the cable, and stopped along the cable at about every fathom; and let a hawse rope be bent to the end of the cable. When all the bowlines are fast, unbit the cable, and haul out upon the starboard bowline; let a hand cut the stops as the cable comes out of the hawse; and when a long bight is out, haul upon the larboard bowline, and trice this bight up to the bowsprit. Should this one bight not sufficiently expend the cable, that its end may be taken round the other, hang it to the bowsprit, and send down the larboard bowline for a second bight. When the end of the cable is round the other, shift the hawse rope and haul it in again. If the hawse is now clear, bit the cable and unlash, otherwise the end must go out again, and be passed round the cable the ship is riding by, till the hawse is perfectly clear.

REMARKS.

Should it blow fresh, and the tide to windward, it may prove dangerous trusting to the lashings alone, lest the cable should run out end for end. In this case bend a hawser with a rolling hitch to the clearing cable, below the turns in the hawse, and let it be hove well taught as a double security.

If the weather is moderate, and the tide easy, the hawse may be readily cleared, notwithstanding the ship is riding by the clearing cable. Thus bowse the clearing cable well up out of the water, and bend to it a hawser, from the hawse, below the turns. Then unbit the cable, veer away upon the hawser, and stick the headmost cable round the other till its end is clear; when, heave in upon the hawser, take in the cable again, and bit it.

How to Act when Riding hard between the Cables.

Should it come on to blow a gale of wind when a ship is moored, from that quarter which will oblige her to ride equally by each cable, and the hawse is clear, it will be necessary to splice a second cable to the small bower, and to veer away equally upon both cables; but should the hawse be foul, and it is expected that the cables will damage each other, then bend a hawser, below the turns in the hawse, to the small bower, which slip, and let the ship swing to the best bower. When the weather moderates, heave in the end of the small bower, and the ship will be moored as before with a clear hawse.

To Unmoor a Ship.

Suppose a ship to be unmoored had her best bower to the ebb, in that case let her be unmoored upon the ebb tide; but was there any necessity for unmooring upon the flood, the stream cable must be spliced to the small bower. To unmoor upon the ebb, when it has made strong, veer away the best bower, bring to and heave in the small bower, and keep veering away the best, till the small bower is up and down; then stopper the best bower. The small bower up, cat the anchor, shift the messenger, bring to the best bower, and heave in to the whole or half cable service, as may be thought necessary; then bit the cable, and fish the small bower anchor.

REMARK.

Should a ship be under the necessity of unmooring upon a windward tide with a strong wind, it will be extremely difficult and dangerous to take up the sternmost anchor. In this case,

if there are no ships in the way, the headmost anchor may be taken up first with safety, and the sternmost cable be hove in towards slack water.

UPON GETTING UNDER WAY.

To Cast a Ship, riding Head to Wind, in a Place where there is no Tide.

To cast a ship, riding head to wind, in a place where there is no tide, let the cable be hove in short; send hands up to loose the topsails, which let be sheeted home and hoisted; and if it is required to cast the ship upon the starboard tack, brace up the head yards with the starboard braces, and the after yards with the larboard braces: then put the helm to port, and send the hands to the capstern, to heave up briskly the anchor. When the anchor quits the ground, the ship, by the assistance of the hélm and sails, will pay round to port; then hoist the jib and fore topmast staysail to help her. The anchor to the bow, fill the head yards, keep the ship her course, and trim and make sail as required.

REMARK.

Should the wind blow fresh, it will be proper to cat the anchor before the head sails are filled.

To Cast a Ship when Tide-rode with the Wind ahead.

To cast a ship when tide-rode with the wind ahead, the same practice must be followed with the *sails*, as to cast a ship when wind-rode and no current; but the *helm* must be put the contrary way, for now the effect of the *helm* is by the tide's passing her, which in the former case was by the ship's stern way.

Upon getting a Ship under Way with a leading Wind in a Tide's Way.

If the ship to be got under way has a leading wind, and is in the midst of a number of vessels, or in a narrow channel, where it would be difficult to cast her upon the lee tide, she should be got under way before the weather tide is done. Thus the casting of the ship will be avoided; and she may be steered through the channel or fleet with safety.

REMARK.

Should it blow so fresh upon the windward tide as to force the ship end-on with her cable, it will be impossible to heave it in without sheering the ship over from side to side, and heaving in briskly as the ship slacks the cable; but as this is attended with considerable danger, by the sudden bringing up of the ship upon each sheer, it will be prudent to heave apeak upon the first setting of the windward tide, before the ship swings, to bring the wind aft.

To cast a Ship from her Anchor, upon a Lee tide, and back her astern clear of Danger.

To cast a ship from her anchor, upon a lee tide, and back her astern clear of danger, upon the starboard tack, let the cable be hove in apeak; then set the three topsails braced up with the starboard braces, and put the helm to starboard. Now heave up the anchor, and as it quits the ground, by the effect of the helm the ship will cast, bringing the wind upon the starboard bow; and immediately she gets stern-way, the effect of the helm will be to keep her to the wind.

While the anchor is coming up from the bottom, the ship will keep to the wind, and back astern extremely well; and by the time the anchor is hove up to the bows, it may be supposed the ship has backed clear of the danger; when, shift the helm, run up the jib and fore topmast staysail, and shiver the after sails. Thus the ship will veer round in little room; when, trim as required.

REMARK.

It must be remembered, that a ship will not readily veer till the anchor is close up to the bow; therefore when a ship is to be got under way from deep water and a narrow channel, it is best to make a stern-board from her anchor, which will back her over to the shore, astern by the time the anchor is up, and give her room to veer round.

UPON SETTING AND TAKING IN SEVERAL SAILS IN BLOWING WEATHER.

To set a Mainsail in a Gale of Wind.

To set a mainsail in a gale of wind, before the sail is loosed, let the double block of a tackle be made fast to the weather clew, and the single block be hooked low down upon the chestree,

To take in a Topgallant Sail, blowing fresh.

To take in a topgallant sail, blowing fresh, the lee sheet must be started first; for if the weather sheet is first eased off, the yard will fly fore and aft.

To bend a Course.

To bend a course, stretch the sail athwart the deck, the starboard side of the sail to the starboard side, the larboard to the larboard side; then bend yard ropes to the earing cringles, and make fast the head earings a few feet up upon the yard ropes. The buntlines, leechlines, clew-garnets, and all the geer bent, make fast a rope-band to each buntline and leechline leg, that the men may be enabled to catch the head of the sail from the yard. Now man well the yard ropes, buntlines, leechlines, and clew-garnets, and run the sail up to the yard. The sail aloft, send the hands up to bring it to; haul out the weather earing first, then the lee; and if it is a new sail, ride the head rope to stretch it. The sail being hauled square out upon the yard, make fast the rope-bands, keeping the head of the sail well upon the yard. Should it blow hard, it would be proper to reef the sail over the head, before it is sent aloft.

To bend a Topsail.

To bend a topsail, overhaul the leeches of the sail, put in the earings, bend the bowline legs, lay out the clews, and open them if necessary, and make the sail up snug again; then round down upon the lee topsail haliards, till the weather fly-block is high enough to bring the sail up over the guard rail; when, rack the tye over to the weather topmast rigging. Now bight the sail up upon slings, with the lee side uppermost; hook on the topsail haliards, and run the topsail up into the top; then stretch the sail round the fore part of the top, bend the geer, make fast the head earings a few feet up upon the reef tackle pendants, with a rope-band or two to each buntline leg. The geer being bent, man the reef tackles, buntlines, and clewlines, and haul out the sail. Let the hands lay out upon the yard, and haul out the weather earing first; then haul out to leeward, and ease off to windward till the sail is square; when make fast the rope-bands, keeping the head of the sail well upon the yard.

To unbend a Course in a Gale of Wind.

To unbend a course in a gale of wind, first furl the sail, then cast off the rope bands, and make them fast round the sail, clear of the gaskets. When the rope-bands are all off, ease off the lee earing, and lower down the sail; and when the people upon deck have got hold of the lee part of the sail, ease away the weather earing.

To unbend a Topsail in a Gale of Wind.

To unbend a topsail in a gale of wind, first cast off the points of the reefs, keeping fast the earings; then furl the sail, and cast off the rope-bands, which make fast round the sail, clear of the gaskets. After this cast off the lee earings, and haul the lee side of the sail into the top; then haul in the weather side. Now unbend the reef tackle pendants, buntlines, and bowlines; bight the sail snugly up together; and send it down by the clewlines to windward or to leeward as most convenient.

RESPECTING CABLES, NIPPERS, AND STOPPERS.

On Coiling Cables.

All cables should be coiled the way they bit, or the way they run round the windlass, and their tiers should be on the side opposite to that on which they lead. The working cable should lead foremost up the hatchway. The sheet, which being the least wanted, can be triced snug round the after part of the hatchway, out of the way. Should your new cables come immediately from the ropewalk, let them be coiled down into the craft that is to bring them on board, the same they are to be coiled on board.

A cable generally kinks from more turns being forced into it by the coiling than it naturally had, and the only way to get rid of these kinks, is to coil the cable across the hatchway from side to side, in large fakes, with the sun; then take the upper end through the coil, and coil the cable down in the tier the way required. By this means, as many turns will be taken out of the cable as there are fakes coiled round the hatchway.

It should be a rule in coiling cables never to lay out near the hatchway, but to keep that part of the tier as low as possible, that the bends may have sufficient room to upset.

Were all store cables first coiled down from the rope-walk against the sun, they would be better adapted to coil on either

side of a ship; for a cable coiled against the sun will more easily reverse, and have less kinks in it than a cable coiled with the sun.

On Splicing Cables.

The snuggest and best method of splicing a cable is to put the ends in twice each way; then to pick out the strands, and worm part of them round the cable, and taper away the rest, which let be snugly marled down. After this let there be clapped on a good throat, and two end-seizings of six thread rattling.

The strands of the small bower and stream cable had better be pointed, that these cables may be more briskly spliced in case of necessity.

On Serving Cables.

Cables should be served against the lay. The most expeditious way of clapping on rounding is with a top, when there is room to work it, otherwise, recourse must be had to beating it on with mallets. Be careful to let the service be stopped with spun yarn every six or eight turns.

Mooring services are generally clapped on about fifteen fathoms from the end, or splice of the cable; and large vessels should have about twelve or fourteen fathoms of service, half of it rounding and plat, and the rest kackling. Upon the working cable, there should be a short service of eight or ten fathoms at the half cable.*

Mats, made the width of the round of the cable, and about three fathoms long, are very convenient to have at hand, to lace on the cable with expedition in cases of necessity.

Of an approved Dog-stopper.

An approved form for a dog-stopper is to have it made with a large eye, that it may be thrown over the bit-head, and shifted from side to side at pleasure.

Of an approved Bit-stopper.

An approved form for a bit-stopper is to have it about four or five fathoms long, and tailed out, nipper fashion, at one end, and knotted at the other: let this stopper be rove through the hole in the knee before the bits. To pass it, let it be led aft, inside and over the cable, then under the bit-end, outside the cable, and worm its end round the cable before the bits. Now,

* A piece of pump leather put in over the plat in the wake of the hawse hole, is excellent in a gale of wind.

to stopper the cable, haul taught the worming, and by the cable's drawing forward it will taughten the stopper, and bind the cable so close to the bits as effectually to bring the ship up. From the nature of this stopper it is not likely to jamb, therefore extremely well calculated for bringing a ship up with ease, as by slacking or hauling taught the worming, the cable may be suffered to run out or be checked at pleasure.

In heaving up in a sea, when by a sudden pitch of the ship the messengers or nippers give way, this kind of stopper will be found extremely serviceable, for upon these occasions, it may be always passed ready, and the bight triced up abaft the bits with a rope yarn, clear of the cable.

REMARK.

Stoppers from the wings of the tiers are extremely serviceable; but stoppers from the mast, below the combings, are of little service, unless they may be made long enough to clap on above the combings.

Upon Ring Ropes.

Ring ropes are better single than double; for when single they are passed with less confusion of turns. To pass a single ring rope, and have it in readiness to check upon veering away cable, take three slack turns through the ring and round the cable, one before the other, and let a hand hold up the parts fair: then take as many slack turns of worming round the cable, before the ring, which let be held up fair by another hand, giving sufficient room for the cable to pass through. Now, when it is necessary to check the cable, haul taught the worming, and the cable's going out will presently draw those turns taught which were taken through the ring, and bind the cable so close to the ring, as to prove an excellent stopper.

Upon Nippers, and the Manner of clapping on a Racking Nipper.

The usual method of clapping on a nipper, with a round turn round the messenger and another round the cables, is an exceeding good one, and very suitable to quick heaving; but when a strain is to be hove, and the cable is muddy, the nippers clapped on after this method will not bite, and recourse is generally had to hitching the messenger, a very bad practice, which justly deserves to be reprobated, as in the nip it materially damages both cable and messenger. In this case throw sand or ashes upon the cable, and take a long dry nipper, which middle and pass one half aft, racking it in and out round the cable and messenger; then worm its end round the messenger

only. After this, pass the other half in the same manner forward, but worm its end round the cable only, and let a hand hold on each end of the nipper. Now the advantage of this method is, that by the cable's drawing forward, and the messenger aft, the nipper will be drawn so taught as effectually to hold the cable till something gives way: another advantage is, it can never jamb, for both ends are clear for taking off.

Upon recovering a Vessel upright, without cutting away her Masts.

It often happens that by a sudden squall of wind a vessel is thrown over upon her beam ends, without a prospect of recovering her erect while she remains upon the same tack, therefore attempts are made to veer her; but as the rudder lies along the surface of the water it becomes useless, and as the sails are either blown from the yards, or become unmanageable, recourse is had to cutting away the mainmast and mizen mast, that the ship may veer under the foremast:—a most desperate expedient, particularly if the ship is far distant from port! Upon this occasion, that the ship may be recovered upright without cutting away the masts, let the following method be practised. If she is in a situation where she cannot be brought to an anchor, let go her lee anchor, which will swing her windrode, and relieve her from the strength of the wind; but should she, in this dreadful situation, be at sea, let the end of a hawser be handed over the lee quarter and round to windward, and to it be bent any of the small anchors,—half-butts,—spanned gratings,—or any thing at hand that will act as stopwaters; then throw the whole overboard, and veer away upon the hawser to a necessary quantity, when make it fast. Now by the ship's drifting from this tow, it will pull with such power upon her stern as to veer her, and bring the wind upon the opposite side.

To clear Vessels that have run aboard each other.

It frequently happens that two vessels which have run aboard each other are so completely bound together, either by the tide, or the wind and sea, that it is out of the power of the helm and sails to force them asunder. On this occasion, if the vessels are in a situation where they can come to an anchor, let one of them bring up and the other will drift clear of her: but should they be at sea, let the weathermost vessel be brought up by the floating anchor, or by a tow from her bow, as mentioned in the foregoing article.

Upon Steering a Ship which has lost her Foremast.

A ship that has lost her foremast can only be steered with the wind aft, and that not without being subject to broach to. Directly a ship in this situation receives the wind sideways, all the lateral pressure of her sails will be abaft the centre of gravity, which her rudder not being able to counteract, must oblige her to approach the wind: but could the power of the rudder be increased to any required degree, a ship could be steered with the wind beaming, notwithstanding the loss of her foremast. To do which, let the following method be practised: —veer astern 20 or 30 fathom of cable, which, if the ship is in shoal water, should be buoyed up. Then rig out a boom with a stout guy upon each quarter, and let the guys be bent to the cable a few fathoms abaft the stern. While the ship is sailing before the wind, let the cable be guyed to tow amidships of the stern, and it will prevent her from broaching to; but while the wind blows sideways upon the ship let it be guyed out to the lee boom, which will greatly assist the weather helm.

Upon hauling a Vessel off a steep Shore in a Calm.

It has often happened that vessels have been driven, in calm weather, upon a steep and dangerous shore which has denied anchorage, but might have been saved by exertion and judgment. Cases of this kind require great animation on the part of the officers. All boats must be immediately hoisted out to tow the ship, if possible, from her perilous situation. In the mean time let stop-waters be got ready to run out from the vessel, and haul her off, should towing prove ineffectual. Large butts cut in halves and slung, serve excellently for this purpose, and are used to advantage in the following manner. Let each boat take several of these half butts, and row away from the vessel with a coil or two of small rope: when the rope is out, span the boat from head to stern, and tow the half butts from the opposite gunwale of the boat, at several fathoms distance; thus, when the rope is hauled in on board the vessel, the boat will hang athwart, and, together with the half butts, must oppose considerable resistance. To draw the vessel ahead, let the boats employed row out alternately, that one line may be in readiness to haul upon, when the other is all on board. Should it remain calm, or should there be a light air of wind opposed to the vessel's course, the sails must be furled.

To prevent rolling away the Masts upon coming out of Port, with new *Rigging, immediately into a high Sea.*

Vessels have frequently rolled away their masts from coming suddenly out of port into a high sea with *new* rigging. On an occasion of this kind, if one of the bower anchors be let go, and a necessary quantity of cable wore away, it will bring the ship's bow to sea, when she will roll less, and afford an opportunity for securing the masts.

CONFORMABLY to the object of this work, which is to promote the safety of lives and property, the author inserts the following miscellaneous hints, which are principally deduced from his own experience. He does this in the trust that they may at least, on some occasions be found useful, and tend to the object for which they are intended.

Some Remarks on Sailing Schooners.

In a gale of wind a sharp built schooner is hove to under the double reefed foresail. After the bonnet is off, the sail is lowered down, and the sheet hauled aft: the reef earing or plat being reeved through the cringle, the sheet is to be eased off, while the cringles are hauled close together. Pass as many turns of the plat as may be necessary, reef the sail, and hoist it up: haul the sheet as flat aft as you can get it, the flatter the better, to prevent her from head-reaching too much; and also, when she comes up, to prevent it from shaking. While the foresail is kept full, the vessel continues to head-reach, which keeps a constant action of the water on her rudder; and this prevents her from falling off into the trough of the sea. If she is very sharp, and it is seen that she head-reaches too fast, it is then necessary to hook on the weather sheet, and haul the sail amidships.

In some sharp built schooners, it is necessary to hoist the head of the mainsail, to assist in keeping them to. The helm must not be put hard down, but a little to leeward, or as circumstances may require. In sailing such a vessel by the wind, when it is blowing in squalls, it is usual to touch her up in the wind; but if the wind should be variable, sometimes coming on the quarter, and sometimes ahead, to luff her up in this manner would be attended with danger. Sail ought to be made snug; for if a squall should come suddenly on the quarter, it will be too long a luff before the sails touch; and if it come ahead, will take aback.

A flat built schooner is often hove to under a balance mainsail; but if this be done she must be very flat, and will not lye to, in any way, under a foresail; so that while she is lying to under a balance mainsail, she will come up and fall off; the after sail will bring her up in the wind: she will first lose her head-way, and afterwards get stern-way, and by her helm being to leeward, she will fall round off before she gathers head-way. The wind being then on the quarter, she runs ahead with violence, again comes up in the wind, and continues coming up and falling off; but on account of her being so flat, and consequently having little hold of the water, she will drift so fast that the sea will be made smooth: it therefore cannot reach her. But if a sharp built vessel should fall off in this way, in the trough of the sea, her decks would be in great danger of being swept.

Shallow flat built vessels are much more liable to be upset in a heavy sea than those of any other construction, on account of their having but little hold of the water, notwithstanding their great stability in a river, or smooth water. It is almost impossible to upset them by carrying sail.

Dutch galliots, being flat, and having but little hold of the water, are often upset at sea by a heavy lurch, when the sea strikes them under their bottom.

It must be recollected that the lee sheet of a schooner's topsail must be the first clewed up, otherwise the sail is liable to get over the lee yard-arm, on account of a schooner's topsail having proportionably more spread at the foot than square rigged vessels. A schooner's weather braces must not be hauled too taught, otherwise they will be carried away or break the yard, by the spring of the masts, &c.

A careful person ought to be at the helm of a schooner carrying sail in squally weather, when it is necessary to luff up and touch the sails. At such times the square sails ought to be handed. At such times I generally took the helm myself.

In tacking a schooner much depends on working the lug foresail briskly. It ought to be hauled over, while head to wind, as quickly as possible, but not to make a back sail.

On Boat Sailing.

I shall insert only a few cautions on this subject, which are frequently neglected, and which are attended with danger.

A boat is very liable to be upset, by jibing with sail set, and by flaws, or shifts, or sudden gusts of wind. Persons unacquainted with boats frequently get on the weather side on those occasions; and the boat being taken aback, that side becomes the lee side, and the boat is upset by their weight, before they

can change their position. It is usual to luff, when sailing by the wind, when a puff of wind springs up; but if this puff should come abaft the beam, it will be too long a luff. It is better to let the sheet fly, or to keep off. I have seen a boat upset in a fresh breeze, by a number of people being to windward when the boat was luffed up. The boat, losing the wind out of her sails, canted over, before the people could change their position, without her being taken aback.

Necessity of attending to the Pump, on first coming out of Harbour.

After a vessel has laid a considerable time in port, the seams of her upper works in general become somewhat open, and by the rolling of the vessel, when at sea, they, being frequently wet, in a short time swell, and become tight. This, however, may not be the case, until she has admitted a considerable quantity of water, which, if no precautions are taken, may damage part of the cargo, before such a thing is expected. This may be prevented by pumping frequently on first leaving port, until the seams are perfectly tight.

Sailing in Shoal Water.

A vessel sailing in water so shoal that the keel is near the ground, will sail badly, steer badly, and stay badly, if she will stay at all. This is occasioned by the counteraction on the rudder of the eddy water which runs near the ground. A vessel, in this case, is best stayed by dropping an anchor, as soon as she is luffed head to wind, (if it is perceived that she is not likely otherwise to stay;) and as soon as she takes the other way, to heave up the anchor briskly. The Bordeaux pilots are very expert at this manœuvre, which they find frequent occasion for in some of the passes at the mouth of the Bordeaux river. I was beating out of Bordeaux river by Pass de Grave, in 1807, with the ship Mercury, at nearly low water, when this expedient saved me from the necessity of either anchoring or running back: in either of which cases I should have been obliged to wait the whole flood tide.

Some assert that a vessel in shoal water will draw more water than when she is in deep water, intimating that the vessel is attracted by the bottom, when thus near, to a very sensible degree; and they claim as a proof of this fact, that when a vessel comes suddenly on the ground, the water rises up about her. But this may be accounted for in another way. It is a well known fact, that a vessel going fast through the water, always carries with her considerable eddy water. When, therefore, she is suddenly checked, this eddy water continues for a short

time after its cause ceases, and consequently produces a momentary swell of water about the vessel. On such occasions I have sometimes seen it rise as high as the mizen chains. In order to do away any possible doubt on the subject, I sounded with the lead in the ship Mercury, on the Pea Patch, at slack water, when the vessel touched the bottom; and found no increase of her draught.

On Running for Land,

It is highly important that only such sail should be kept on the ship as she may be able to bear close hauled. During thick weather or night, it ought always to be considered whether the ship be running towards a bight or projecting land: for if you get into a bight, you may find it difficult to get out again.

It is imprudent to run for land in the night, without it may be such land as may be seen from a considerable distance; and even if it be high land, situated at a distance in the interior, you may be deceived, and run your ship on shore, as it is impossible to know from the chart, how far from the shore those mountains may be.

If you run for land at night, on the faith of a good lunar observation, taken during the day, you may be deceived by a current running towards the land. Among the West India Islands, there are regular tides, which run six hours to windward and six to leeward, in many places at the rate of three, and sometimes four miles per hour. In many places currents have been known to run towards the land, at the rate of five miles per hour; and a lee current will often be running for several days together, which may overcome the weather tides, mostly among the Windward islands and keys. If, therefore, you should get into these lee currents or tides, in the night, near the land, you may by them be carried on shore.

From these causes, heaving vessels to, when land is near, may be attended with danger. Several cases have been related to me wherein ships heaving to, where no land was seen before night, have drifted ashore before day-light; and the following instance will further exemplify these facts.

In 1797, when in the schooner Commerce, of Philadelphia, bound to Cape François, in running down for Turks Island, my reckoning being nearly out, I went up to the topmast head about sunset, but could see no land. Nevertheless, having some fears of a lee current, I did not heave the vessel to, but beat her under a press of sail during the night; and the next morning at day-light, the land was under our lee, not more than two leagues distant. If I had hove to, I should have been driven ashore.

A flat bottomed vessel, in a common trade wind, if hove to,

will drift at least three miles per hour. If this be combined with a lee current, it is dangerous.

Some navigators when expecting themselves to be near land, are in the habit of running after sunset, as far as they can see. But this ought to be avoided as dangerous.

When running for places of which the longitude is not well established, great caution ought to be used in thick weather, or at night.

On looking over the Side for White Water in the Night.

In running towards land among the West India Islands, or any tropical islands or land, where the banks extend off to any considerable distance, a change in the appearance of the water, will sometimes warn you of danger. It is of a lighter colour than it is off soundings. In consequence of neglecting to notice this indication, I was cast away in the brig Active, of Philadelphia, Captain Nathaniel Gardner, of which vessel I was mate. She ran on a reef one league to the eastward of the Hogsties, and was lost, an account of which is given hereafter.

Cautions on Lying to at Night, where Shipping are expected to run.

In the British Channel, and all other places where shipping frequently pass, a ship lying to at night, ought to have a light hung up in her weather rigging, or some other convenient place; and in either lying to or running in a fog, the bell ought to be rung, a conch blown, or some other kind of noise made, to warn others that they may not run foul of you.

Caution on Vessels meeting at Sea.

When two vessels are running towards each other, and are very close before they are perceived, the vessel having the starboard tacks on board ought to keep the wind, and that on the larboard tack to keep away. If this become a universal rule, it will save many vessels, and the lives on board. This rule is said to be strictly adhered to by English vessels, though it is not many years since I have heard it mentioned.

A Ship being near a dangerous Lee Shore, in a heavy Gale of Wind.

If a ship should be caught near a dangerous lee shore, in a heavy gale of wind, in endeavouring to keep her off, sail should be carried as long as the hull and masts will bear it; as the wind may abate, or take a favourable change, even when you

think it is the last tack that can be made before she would go ashore. This is one alternative. But if there be a good anchoring ground, at a tolerable distance from the shore, and it is seen that she is losing ground, and cannot clear the shore on either tack, then your chief dependence must be upon a judicious application of your cables and anchors; and it is in any event a disgrace on a commander to let his vessel go on shore, with any of his anchors and cables on board. In this case, backing the anchors, as it is called, is an excellent expedient; and it is presumed that every seaman is acquainted with the method of doing this. The ship being prepared, the two smallest anchors must be got over the bow, and the least let go, the inner end of the hawser being bent to the crown of the other. After the former is veered out, until it becomes taught, let go the second anchor, and thus proceed till every anchor be out, if all be found necessary. If the ground should be foul, no more of the best bower cable should be veered out than will be found safe, as the cable will chafe or cut. If the best bower cable can be kackled where the ground is foul, it might by that means be saved.

If the vessel have good ground tackle thus applied, she will be able to ride out the most violent gale. Her masts ought not to be cut away until the last extremity. The greatest danger will be of her foundering. But if her waistboards, if she have any, be knocked away, to let the water have a free passage off her decks, and the scuttle, companion way and booby hatches be battened down, she will be secure against the danger; and the crew may find some means of securing themselves on deck, and thus wait the event, as a very heavy gale always moderates in a few hours. In the worst case, if the masts be cut away and are overboard, the vessel will be much lightened, and there will be no danger of her foundering.

If the shore should be steep, having a clear beach, and you find you cannot ultimately keep her off, endeavour by all possible means to keep her off till after high water. Then, the main and mizen masts being first cut away, run before the wind and sea, with all possible sail, and run her end on the beach as high as possible, so that, as the tide falls she will be set fast, so as to be out of the power of the sea. After she is thus on shore, if the sea should force her broadside to, she should be given a heel in shore as soon as possible, as by this means the crew would be more sheltered from the sea: for, if she should heel off shore, all hands might be washed overboard.

But if the shore be rocky and steep, so that the ship cannot be run ashore without instant destruction, if there be room enough, or if you are far enough from the shore, every anchor being let go, the cables should be paid out nearly to the bitter end; as near all steep rocky shores there is anchorage. Thus

she may ride until the gale moderates, even if she should be brought up by her anchors at only half her length from the shore; and in this case she will probably be much relieved by the wind rebounding from the rocks. Then the only danger will be from the rocks cutting her cables, which will require a considerable time, sufficient for the gale to moderate.

The Lifts and Trusses

Ought always to be kept taught, as by a sudden squall the lower yard might be carried away. The lee lift may be kept taught by the wind, by having a lizard on it, and a small tackle at the mast head, to hook on abaft the topmast rigging. Lifts are good preventers.

On the Use of Staysails.

Some contend that all staysails are useless, except the storm staysails; that the eddy wind out of them takes the wind out of the squaresails, and makes a back sail, &c. This may be remedied by having the staysails made small, so that the eddy wind may not reach the squaresails. Staysails are very useful in many cases: in anchoring, with all squaresails handed, in running among shipping with a side wind, and often in backing and filling, the staysail is occasionally set, to shoot the ship ahead; and in a tide's way, in light winds, staysails are indispensable to shoot a taught cable from the anchor, when every staysail should be set.

On Sounding with the deep Sea Lead.

The bottom may be reached with the deep sea lead, in deep water, without heaving to. If it does not blow hard, luff to, and shake the sails until the ship nearly loses her way. The staysails and jib must be hauled down, as they will keep full until all the squaresails come aback. A careful man should be put to the helm; and when the sails are in the wind, the ship should be steered on that point of the compass to which she heads. In this manner the lead may be hove, with little trouble and no drift.

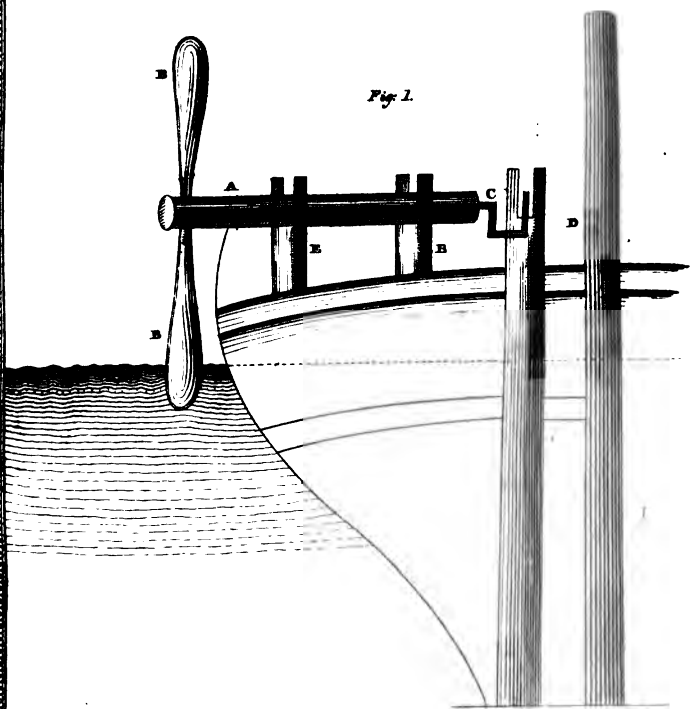
An Account of a Machine for Pumping Vessels at Sea, without the Labour of Men.

By Richard Wells.

In the course of the immense trade now pursued on the ocean, vessels are continually subject to leaks, which too often

Plate XVI.

Fig: 1.



Eng^d by J. Warr J^r Philad^a

prove fatal to the crews, who, wearied out with incessant pumping, are obliged at last to submit to their unhappy fate, and desponding sink into their watery graves. It is therefore much to be desired, that some method could be suggested for preserving the lives of so intrepid and useful a set of men. What has occurred to me on this subject, I beg leave to lay before the society, and flatter myself, it will not prove altogether unworthy of notice.

When a vessel springs a leak at sea, which cannot be discovered, instead of exhausting the crew with continual working at the pumps, they may form with very little trouble, a machine to discharge the water, which will work itself, without any assistance from the hands on board.

Let a spar or spare topmast be cut to the length of eight or ten feet, or more, according to the size of the vessel; mortice four holes through the thickest end, through which run four oars, fixing them tight exactly in the middle; to the four handles of the oars nail on four blades (made of staves) the size of the other ends, which will form a very good water-wheel, if the oars are strong; then fix into the opposite end what is called a crank; the iron handle of a grindstone would suit extremely well; if not to be had, any strong bar of iron may be bent into that form, wedging it tight, to prevent its twisting round: then nail up a new pair of chaps on the fore part of the pump, for a new handle to be fixed in, which will point with its outer end to the bow of the vessel; this handle will be short on the outside, but as long on the inside as the diameter of the bore of the pump will admit, in order that the spear may be plunged the deeper, and of course make the longer stroke; the handle must be large enough to have a slit sawed up it, sufficient to admit a stave edgeways, which must be fastened with a strong iron pin, on which it may work; the lower end of the stave must be bored, to admit the round end of the crank; then fix the shaft with the oars (or arms) over the gunwale on two crotches, one spiked to the gunwale, and the other near the pump, cutting in the shaft a circular notch, as well to make it run easier, by lessening the friction, as to keep the whole steady. A bolt must be fixed in each crotch, close over the shaft, to keep it from rising; as soon as the wheel touches the water, it will turn round, and the crank, by means of the stave fixed on its end, will work the handle of the pump. If the bore be four inches, and the piston or spear moves eighteen inches at a stroke, it will discharge 220 cubic inches of water, and admitting the arms of a wheel to be six feet from the centre, it will turn round about 146 times in a mile, or 730 times in an hour, when the ship sails five knots, which is equal to nine hogsheads. If the surface of the water in the hold be fif-

teen feet from the nozzle of the pump, a man can raise in an hour, with common working, about thirty-eight hogsheads, which far exceeds the work performed by the wheel; but this calculation is made on pumps of the common size, I would therefore propose that all vessels should carry larger pumps, the advantage of which will appear from the following table:

A 4 inch bore will discharge per hour, sailing at the rate of five knots,	- - .	9 hogsheads,
5 inch,	- - - -	14½
6 ditto,	- - - - -	20¾
7 ditto,	- - - - -	28¼
8 ditto,	- - - - -	37

Hence we find, that a pump of eight inches bore, will discharge with the wheel nearly the same quantity that a man commonly raises. If both pumps be set to work by the crank, double the quantity, or seventy-four hogsheads will be discharged; but if a cog-wheel, of about three feet ten inches, with fifty-one cogs, be fixed on the end of the shaft or axis, and the crank be passed through a trundle or lanthorn wheel, of about two feet diameter, with thirteen rounds, to work with the axis parallel to the deck, and fixed to the pumps, in the manner used by brewers and distillers, the crank will make about four turns to one revolution of the great wheel, and of course deliver 296 hogsheads per hour; yet as the resistance made by the pumps will, in some measure, impede the motions of the wheel, it will not turn at the rate of 730 times in an hour, for which suppose a deduction of one third, which is certainly a great allowance, the quantity then discharged per hour is about two hundred hogsheads, which is more than equal to the constant work of five men; thus if a vessel sailing at the rate of five knots, delivers two hundred hogsheads per hour, equal to five men's work,

6 knots is	240	- -	equal to 6 ditto.
7 knots	280	- -	equal to 7 ditto.
8 knots	320	- -	equal to 8 ditto.

I am aware of many objections that will be suggested. In the first place it will be said, that pumps of eight inches bore, will be too large to be worked by the strength of men, when the wheel cannot be applied. I answer, no more force is required to discharge a gallon of water at a stroke from an eight inch, than from a four inch bore; as the short end of the lever or handle to the eight inch bore, need not be above a quarter part the length of the four inch, which will give a purchase to the sailor at the long end of the lever, sufficient to raise the piston or spear a quarter of the height of what is required in a

four inch bore, for a piston moving three inches in an eight inch bore, will deliver just about the same quantity of water. It will be further objected, that in stormy weather, when vessels generally make the most water, the wheel could not be put overboard. I own there is some force in this objection, but if a remedy is beneficial in some cases, though not adequate in all, it ought not to be totally rejected. Many leaks happen at sea in moderate weather, and even those which are occasioned by damage in a storm, often continue when the waves are abated. Sailors are frequently unhappily washed overboard, and possibly those who may have survived the storm, are too few, and too weak, to keep the ship clear of water, and perform the other necessary duties on board, in such cases, this machine would be eminently useful. It may also be urged, that the wind at such time may be so much ahead, that the ship cannot make way enough through the water to work the pumps ; to which I reply, when life is in danger, when grim death stares the affrighted crew in the face, the port of destination is not to be considered, but the vessel must be steered for that shore, which best suits the working of the pumps, and keeping her above water.

I would therefore propose, that every vessel should not only have pumps of eight inches bore, but be provided with a shaft, crank, and proper wheels, which might easily be stowed away in little room, as the paddles of the water wheel may be unshipped, and the whole procured at a small expense.

These hints, together with the model, I submit to the inspection of the Society, and hope some improvement may be made on this plan, which will prove useful to mankind.

REFERENCES. Plate XVI.

A. *Topmast or shaft of the wheel.* B. *Oars or arms of the wheel.* C. *Crank.* D. *Pump.* E. *Props on the deck, to support the shaft.*

On Leaks.

If a ship is generally leaky in the seams of her bottom, the best remedy is fothering, which is thus done : Sew oakum to a sail ; then let the sail down over the bows, with ropes, and confine it to that part of the vessel's bottom which is leaky. But this very much impedes the ship's sailing ; therefore, if the leak is not of great length, or even if there are several of them, it would be better to nail over them leather or tarred canvas. When I was mate of the sloop Illinois, of Philadelphia, in 1792, she sprung a leak near the garboard streak. The leak was considerable ; it was a spall in the plank next a seam. A rope was

girted taught round the vessel's bottom, near the place of the leak, and made fast to each gunwale. A slack rope was made fast to it. By a bowling knot in another rope I went down, and nailed leather over the spall, coming up occasionally to breathe. This effectually stopped the leak. The holes for the nails must be first made in the leather.

REMARK. The vessel must be hove to while this is performed.

To prevent Boats from Foundering at Sea.

Span a small spar, and make a rope fast to the bight of the span; which being done, put it overboard, and pay out 7 or 8 fathoms. Let the boat ride under the lee of this spar, which will keep off the violence of the sea.

The only time that I have found a necessity of resorting to this expedient, it was completely effectual. I was at that time mate of the brig Active, of Philadelphia, commanded by Nathaniel D. Gardner, which was cast away on a reef about three miles to the eastward of the Hogsties. There are two small, low, sandy keys, bearing N. W. and S. E. from each other, and a reef of coral rocks extending, in the form of a half moon, from one key to the other, with several channels through this reef, through which boats may pass. The distance between these keys is about two miles; and these, together with the inside of the reef, form a kind of bay, where there is from 10 to 15 feet water; in some places of which, there are sandy spots, where small vessels may anchor. The S. E. key is round, about 300 feet in diameter; the N. W. 900 feet in length, and 300 in breadth. These keys are nearly even with the surface of the water. The N. W. key bears from the N. W. point of Great Heneaga S. E. by S. distant 40 miles.

We landed on the N. W. key with 26 passengers; and as our vessel filled with water shortly after she struck, we obtained from her but a scanty portion of provisions and water. After remaining on the key six days, our provisions and water becoming very short, Captain Gardner permitted me to rig the long boat with a sail, and go in search of some vessel, or endeavour to get to Cape Nichola Mole, in the island of St. Domingo. On the 30th March, 1794, at 3 P. M. with the wind at S. E. I set sail, with two men, and a passenger, Mr. Granier. The weather was fine; the wind scant. In about an hour we lost sight of the keys, and at 6 P. M. a squall blew from the N. W. accompanied by rain. I saw a frigate to the N. W.; but as she was to the windward, I saw no prospect of getting to her. I therefore kept the boat before the wind. The sea being very high, I put a rope out astern, having understood that in such cases

Plate XXX

En. by J. Warr Jr. Philada.

it would prevent the sea from coming aboard. At 10 P. M. the sea was so high that it was dangerous to scud. Having in 1783 been on board the brig Lively, Capt. Rich, which had lost her rudder on her passage from New Orleans to Port au Prince; I brought to recollection that, in a gale of wind, she laid to, during several hours to a spar. I therefore had the boat's mainmast unshipped and spanded, and a rope bent to the bight; it being then put overboard,, and about eight fathoms of rope paid out, we lay under its lee in safety, during a heavy gale and a high sea of six hours continuance. The next morning at daylight the weather was pleasant; the wind at S. E. and we had got so far to the eastward in the gale, that it gave us an advantage. At sunrise saw Great Heneaga, bearing from S. E. to S. W. distant about three leagues. The wind light, made sail close by the wind, and at 3 P. M. discovered a schooner's masts over the N. W. point of the island. At 8 P. M. got on board of her. She proved to be the Grooper, of East Caycas, Captain Clark.

On the third day after we left the Hogsties, we anchored there in the Grooper, when the provisions on the key would not have sufficed for more than four days. All hands embarked on board the Grooper, and were landed safely at St. Marks.

I do not recollect what I made the latitude of the Northwest Key. It was, however, erroneous, as I took the declination out of an old epitome of Hamilton Moore, in which the declination was one day advanced; for the cause of which error see pages 36 and 38. In consequence of which error in the sun's declination the aforesaid brig Active was lost. We were from Philadelphia bound to St. Marks in the island of St. Domingo. It was Captain Gardner's intention to run for and make the island of Mayaguana; but by the sun's declination being erroneously laid down in the aforesaid epitome, and the daily difference of the sun's declination being twenty-three miles, and being on the 23d of March, 1794, we ran down the latitude too far north; and in the place of making Mayaguana, we made the French Keys, which lay to the northward and westward of the former island, and mistook them for Mayaguana; so that we were fifty miles farther to the westward than we reckoned ourselves, and by that means we ran on the aforesaid reef at 2 A. M. on the 24th of March, 1794.

This error in the sun's declination I learned afterwards.

*Marine Life Preserver.**

In the first volume of the Liverpool Mercury we published, with an engraving, an easy method of speedily converting any

* From the Liverpool Mercury, November 8th, 1820.

ordinary boat into an infallible life-boat, by means of empty casks. I am more pleased with the simple plan which we have now the satisfaction to lay before the public. A ship's boat may be stove or lost; but the apparatus for constructing the life-raft here proposed are always at hand.

Plate XXX. is the plan of a raft for passengers and sailors, when a ship is wrecked, or founders at sea, which has been approved of by the Royal Humane Society. A deputation also from the Trinity House expressed their approbation, and voted the inventor an honorary prize; which he ordered to be paid to the Missionary Society, and received a letter from the late Dr. Haweis, acknowledging the receipt thereof.

EXPLANATION.

A A, is a plank nine or ten inches long, two or three inches thick, and six or eight inches broad. Spars may be substituted. It would be adviseable to fasten some weight with a rope to the bottom of the plank, near the ends; bags of gold or silver, or any other valuable heavy articles, which would act as ballast and keep the men upright, say forty to fifty pounds weight each barrel; but long bags mads with strong canvas, and filled with stones, sand, or coals, would be less liable to shift or get loose. B B, one or two empty barrels or water casks, such as would contain thirty or forty gallons, the larger the better. Two wine pipes or butts would do well on twelve or fourteen feet planks, and would carry all the men that could sit on it. These barrels, pipes, or butts should not have any article put into them that is heavy, but only light articles, as papers, &c. for the more buoyant the casks are so much the better. These casks must be water-tight and closely bunged. C C, C C, is a small rope bound two or three times round each side of the bulge of the cask; and four small notches should be cut on each side of the plank, to prevent the casks from shifting off the plank. D D, is a rope made fast from C C, to C C, on each side, to prevent the men from being washed off the plank, fixed under their arms, so as to leave sufficient room for them to row with their hands. E, E, E, E, men sitting on the plank, between the ropes. If the casks are large, the ropes D D, should be frapped closer together with small ropes, close to the ends of the casks, and once in the middle, so as to have just room for the men to sit between the ropes D D, and row with their hands. A barrel that will hold thirty-six gallons will carry three hundred weight without sinking. Forty or fifty pounds will keep any man's head above water. There is no fear of overloading. It is considered that water-casks, planks, or spars are articles that very few ships sail without; and hav-

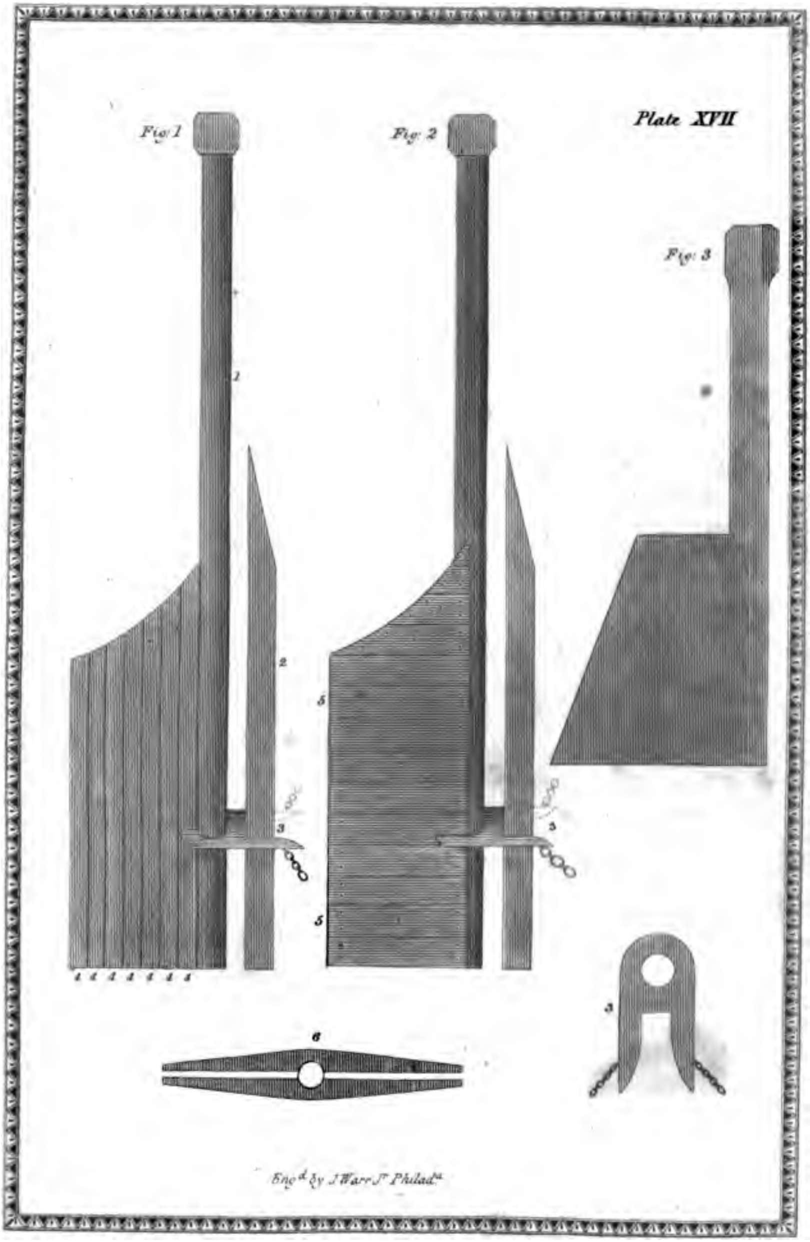


Plate XVII
Fig: 1
Fig: 2
Fig: 3
Eng.d by J. Warr Jr. Philad.a

ing the means in their own power, the mariners are more likely to escape.

The only objection the inventor ever heard to this plan is, that the sailors would be likely to leave the ship too soon; but this is not probable; for they would not readily leave the ship, if there were any chance of saving her; besides it would be safer for men to sit on planks till the ship goes down.

When the Tiller is Broken

In the rudder head, the rudder must be immediately chocked, that the stump may be taken out, and another tiller fitted in. While the rudder is useless the ship must be laid to.

On Losing a Rudder at Sea.

The readiest way to supply the place of a rudder, till a better can be made, is the following:—To a long spar lash several pieces of junk and spars, from six to ten feet long, beneath each other: stiffen them by nailing boards across them; at the bottom attach a weight of some kind to sink it, and put it over the stern: then, by means of guys, topping-lifts and tackles this may steer the ship until a better rudder be made.

On Temporary Rudders.

The following is a description of a temporary rudder, invented by captain Edward Packenham, of the British navy.

Plate XVII. Fig. 1. is a topmast inverted, which constitutes the main piece of the rudder; its heel becoming the head, which is secured by anchor hoops, the fid hole may be enlarged so as to receive a tiller. This main piece is pointed through a topmast cap, which is enlarged so that the main piece may turn in it. 3. represents the cap, with its square part cut out to fit the stern post. Fix chains to it, if there be any on board. Upon the after part of the main piece, small pieces of spars, about the size of the jib-boom must be bolted or trunnelled and stiffened by plank or boards being nailed across it. 6. is an anchor stock, cut out to receive the round part of the main piece. The whole being prepared, let it be got under the stern, and its head hove up, through the rudder case to the necessary height. To each of these chains bend the end of a hawser, from the hawse holes: then bear the rudder a-midships, and heave taught the hawsers, which will secure the cap of the sternpost: then the anchor-stock must be secured to the deck, round the rudder head, that it may act as an upper gudgeon for the rudder to turn in, the tiller being fixed. The vessel is now fitted with a

rudder nearly as perfect as the former. Fig. 1. is a representation of the temporary rudder before it is planked across, and Fig. 2. represents it after it is planked across. 4. the backing. 2. the sternpost. 5. the stiffening.

Description of a Temporary Rudder

Invented by Captain Jacob Baush, on board the Ship Missouri, of New-York. Plate XVIII. Fig. 4.

This rudder is an improvement on that invented by Captain Packenham, and is better suited for the practice of merchant ships, where the same conveniencies for the purpose cannot be obtained, as are furnished by ships of war. He converted his mizen mast into this rudder in the following manner. He cut it to a suitable length; with the upper part of which he made his main piece. The lower part being then hoisted out, it was split up to serve as backing pieces. The catheads being cut and bolted together with chocks between them, was converted into the cap for the rudder; the top rails being used for bolts. Having no plank to stiffen the back pieces across, rope woulding was substituted for it: and having no chains, like Packenham's a score was cut in the cap, the bight of the stream cable brought round the score, and the ends passed forward, and hove taught, to confine the rudder to the sternpost. An anchor stock, secured to the deck, served as an upper gudgeon; and a score was cut in the main piece, above the deck, to let in the anchor stock, to prevent the rudder from jumping up. This rudder was then sunk by the kedge anchor, with slip ropes, &c.

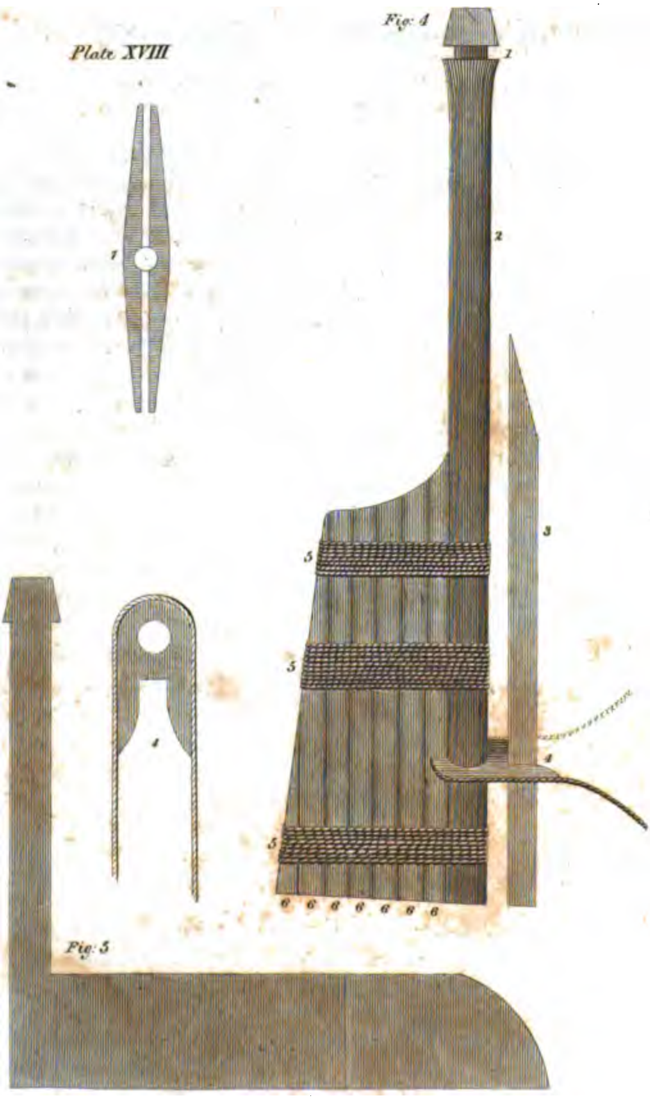
1. The notch in the neck.
2. The main piece.
3. The stern post.
4. The cap.
5. The rope wouldings.
6. The backing.

On Rudders of Shallow Vessels.

Plate XVII. Fig. 3. is a representation of a rudder suitable for shallow vessels, such as galliots, &c. Some river craft are long, and draw but three feet water. Their rudders, therefore, have only three feet perpendicular hold of the water, but are from six to eight feet in width, fore and aft, in order to give it sufficient power.

Plate XVIII. Fig. 5 is a model of a rudder suitable for river craft, about 80 feet in length, and drawing only three feet water. It is evident that if these rudders were made only equal in

Plate XVIII



Eng^d by J. Warr J^r Philad^a

width to those of vessels drawing ten feet water, they could not be steered, because their rudders would not have sufficient power. Therefore, as they cannot have a sufficient perpendicular force, they must make up the deficiency by giving their rudders a proportionably greater horizontal scope.

I have been astonished to see some flat, full buttocked vessels with rudders constructed in the same manner as those of sharp built vessels. These vessels hold much dead water, and their rudders are acted upon by considerable eddy water, the power of which is increased in proportion to the velocity with which these vessels move through the water, and they consequently steer more or less badly in the same proportion. Such vessels may be made to steer much better by having rudders constructed narrow in the place where the eddy water acts upon them, and increased in width below, where the water acts fairly on them. I once tried this method on a flat, full built vessel; which though it did not make her steer like a pilot boat, at least improved her steering in a very great degree.

The ship Roebuck was a shallow, flat-bottomed vessel, full aft, and of course held much dead water, and her rudder was affected by considerable eddy water. In the year 1798 I sailed in company with this ship, from Philadelphia bound to Havanna, under the convoy of the Delaware sloop of war, Captain Decatur; when the Roebuck steered so extremely bad, that Captain Decatur desired us to give her a birth, for fear she should yaw on board of us. On her arrival at Philadelphia, her rudder was taken to the ship-yard of William and Boyer Brown, who was fixing a gutter to its back, in order to remedy its defects. I advised him to adopt the above plan; but he preferred his own, and the ship steered as badly as ever as long as she existed.

Rudder Braces

Should have two bolts each, which ought to be passed through the stern-post and rudder, and clenched. If this be done, and any thing should strike the rudder, so as to break the braces, they will break by the bolts, and no further damage will be done. But if they be not so bolted, the braces may be knocked off the vessel's bottom, and drawing the nails, leave a leak at every nail hole, cases of which have frequently taken place.

On coming to Anchor in light Winds.

On coming to anchor in light winds, or in a calm, when the anchor is let go, the cable is left slack round the windlass, when only the pea of the anchor takes the ground. If a sudden puff of wind should spring up, a vessel thus situated might drift into

danger before sufficient cable could be given her. It is therefore very prudent that a sufficiency of cable should be stuck out to let the anchor lay flat on the ground.

On coming to Anchor when the Wind is Fresh.

Vessels coming to anchor when the wind is fresh frequently drift, in consequence of an insufficiency of cable being given them at once. If there be room, a length of cable should be given sufficient to bring a ship up, and after the anchor has taken good hold, all that is not necessary can be hove in. If there be but little room, there is the greater danger in the ship's drifting; and therefore both anchors should be let go until she is brought up.

On Anchoring in Eddy Tides.

In a tide's way there is always an eddy tide near the ground; and a ship in shoal water will be affected by it. This will occasion her to sheer about very much, and go round her anchor.

If a ship should anchor in shoal water, and upon a weather tide, she will range ahead of her anchor, the cable ranging taught under her bottom; and if she should be heavy sparred, and a little crank, and the wind should strike her suddenly on the side opposite to that of her cable, she will be likely to upset, break her cable, and do other damage.

On Pall Bits.

Before a ship comes to anchor, a chock should be put beteen the pall bit and the foremast. For the want of this precaution many vessels have had their windlasses upset, the pall bit being pressed forward, and the palls leaving the windlass.

In 1809 I was lying in the Downs, in the brig Sylph, of Philadelphia, where there also lay a brig belonging to Norfolk. By this vessel's pitching in a heavy sea, her pall bit was pressed forward, so that the palls dropped clear of the windlass. The windlass ran round with great velocity, and the cable, not being clenched, ran entirely out; and had not another anchor been ready and let go, she would probably have drifted foul of some of the vessels lying at that place.

When a boy, I was on board the ship Angelica, of New London, Captain Parker, lying in Hampton Roads, when, by the ship's pitching in a swell, while heaving in the cable, the pall bitt was pressed forward, the palls dropped from the windlass, and it upset, precipitating a man with a handspike over it, quite to the night heads, and dreadfully bruising him: and I doubt

not that similar accidents are frequent. A ship in Table Bay, Cape of Good Hope, had her windlass upset in this way; the cable ran out end for end, and she drifted ashore, before another anchor, which was let go, could bring her up.

In 1806, in the ship Orion of Philadelphia, I was coming to anchor in Simon's Bay, at the Cape of Good Hope, the wind blowing nearly a gale, and a heavy sea running, although both ends of the cables were clenched, if I had not used this precaution, the cables would have run out to the bitter end, and the ship would have drifted athwart hawse of the Adamant fifty gun ship.

Pall-bits are often defective in the wake of the deck, when their defects cannot be perceived.

On Cross Bearings.

After a vessel has anchored in a road, three cross bearings should be taken, the more readily to find the anchor, if the cable should be parted. If the weather permit, these bearings should be taken from over the anchor. A land mark should also be set, by which you may know if the vessel drifts.

On lying at Anchor in a Roadstead, among a Crowd of Ships.

There is sometimes more danger, in roadsteads, from other vessels drifting athwart your hawse, than from your own vessel's drifting. For instance, in such a roadstead as the Downs, where vessels from all parts are hourly coming to anchor, more particularly those from the East and West Indies, with their cables dry rotten, which are liable to break with the least blow, and drift foul of other vessels. In 1809, I laid six weeks in the Downs, in the brig Sylph, during which time we had several blows; and all the damage which was done was occasioned by vessels, having bad cables, drifting foul of others.

On Anchoring in Places where you are not acquainted.

In anchoring in such places, the time of tide ought to be calculated and allowed for, particularly where there is a considerable rise and fall of tide.

In the brig Tryphena, of Philadelphia, in 1800, from Philadelphia bound to Amsterdam, having the wind from the eastward, I anchored to the westward of Dungeness. Shortly af-

terwards a ship anchored there, a little in shore of me. She came to anchor at nearly high water, and at nearly low water she struck the ground, and was obliged to carry out an anchor, and heave off. The rise and fall of tide at this place is 24 feet.

On the Great Fall of Water in the Java and China Seas.

I have been informed by several captains of country ships, that the tides in the Java and China seas often fall below their common level at least four fathoms. If this be the case, it would be dangerous to anchor in those seas where there is but little more water than the ship draws; and the truth of this would account for rocks and breakers which have been seen by some, and not by others, sailing in the same track through them.

Diurnal and Extraordinary Tides.

If a place communicate with two oceans, or two ways with the same ocean, one of which is a readier passage than the other, two tides may arrive at that place at different times, which, interfering with each other, may produce a variety of phenomena. At Batsha, a port in the kingdom of Tonquin, on a river in the gulf of its name, on the coast of China, in latitude about 20° 47′ N. and long. 106° 55′ E., the day in which the moon passes the equator, the water stagnates without any motion: as the moon removes from the equator, the water begins to rise and fall once in 24 hours, and it is high water at the setting of the moon, and low water at her rising. This daily or diurnal tide, increases for about seven or eight days, and decreases by the same degrees for the same time till the motion ceases, at the moon's return to the equator. When she has passed the equator, and declines southward, the water rises and falls again as before; but it is high water now at the rising, and low at the setting of the moon.

Sir Isaac Newton thus accounts for this phenomenon. In Batsha there are two inlets, one from the Chinese ocean, between the continent and the Manillas; the other from the Indian ocean, between the continent and Berneo; and he supposes that a tide may arrive at Batsha, through one of these inlets, at the third hour of the moon, and the other through the other inlet, six hours after. For while these tides are equal, the one flowing out as the other flows in, the water must stagnate. Now they are equal when the moon is on the equator; but when the moon gets on the same side of the equator with

Batsha, the daily tide exceeds the nightly, so that two greater and two less tides must arrive at Batsha by turns. The difference of these will produce an agitation of water, which will rise to its greatest height at the mean time between the two greatest tides, and fall lowest at the mean time between the two least tides; so that it will be high water the sixth hour at the setting of the moon, and low water at her rising. When the moon gets on the equator, the nightly tides will exceed the daily, and therefore the high tides will be at rising, and the low tides at the setting of the moon. The same principles will account for those extraordinary tides which are observed in the Java and the China seas, as well as in many other places. These diurnal tides I remarked when I was in Batavia in May 1812.

When going through the straights of Banca, in the brig Sylph, of Philadelphia, bound to Canton in June, 1811, I found but four fathoms water where eight was laid down in the chart, which astonished me. Being at the approach of night, I had the vessel brought to an anchor, and sounded with the boat at least three miles each way in four directions; but not finding more water, I concluded there was at that place an extraordinary low tide, the same which I have been informed of by some of the captains of the country ships. I entered the south part of the streights of Banca that same afternoon, and found the usual depth of water at that place, as laid down in the charts.

On Kedging or Drifting in a Tide's way in moderate Weather.

When drifting in a tide's way, an anchor ought to be let go, the weight of which must be proportionable to the size of the ship, and the strength of the tide. Just as much cable or hawser must be paid out as will check the ship in part, so that part of the tide may act on the rudder, and also a part to drift the ship. By this means she can be sheered at pleasure, so that by heaving in, or veering out, the hawser or cable, she may be checked or drifted as required. In this manner I sheered my vessel clear of the ice, in the river Delaware, below Reedy Island, in a calm. At intervals, when there was no ice near me, I had the cable shortened, and by that means sheered the ship in towards the shore; and when I perceived a large cake of ice coming near the ship, I gave her cable sufficient to hold her till the cake had passed. I repeated this experiment until the ship had arrived so near the shore that little or no ice could reach her. I adopted the same measure abreast of Philadelphia. I was no sooner at anchor than the creek and fall

ice came down the river in great quantities. Perceiving that it had struck the vessel adrift, but still part of the tide acting on the rudder, I sheered her in between two wharves, out of the way of the ice. But there ought to be a sufficiency of water when a vessel is thus attempted to be sheered in shore.

On the Danger of Open Heels.

It is astonishing that so little regard is paid to fixing ship's rudders so as to hang close to the sternpost. Many ships have a vacancy between it and the rudder sufficient to admit a six or seven inch buoy rope. If a buoy rope should get into the heel of a ship lying at anchor, she would tend neither to wind nor tide, and by this means be in danger of tripping her anchor, and driving on the ground, as I am informed was the case of a vessel near Liverpool. A vessel with open heels should, therefore, have a small buoy rope that will easily break; or if it can be dispensed with, it is better to have none at all. In a tide's way, or riding to single anchor, however, a buoy is seryiceable. With the vessels which I have commanded with open heels, I made it a general rule to embrace the first opportunity, when they were either hove out or put in dry dock, to have the rudder so fitted that a twine thread could not enter between the rudder and sternpost. I mention this particularly, because I have seen many vessels hove out, and in dry dock, without this fault being remedied.

To Purchase an Anchor out of Stiff Ground.

The best way to heave an anchor out of stiff ground, is to put on a collier's purchase; that is, to hook the cat-block to a strap, on the cable near the water's edge, to clap the fish tackle on the cat-fall, and bring that to the windlass. This purchase, by having no nip or friction in the hawse-hole, will bring up the anchor quite easily. This kind of purchase answers very well to heave up the anchor, when the cable is suspected to be weak or rotten, guards against its being broken by friction or nip in the hawse-hole. This precaution enabled me, in the ship Mercury, to heave up my anchor, after its having laid three months in the mud: without it, my cable would have parted.

Some put on a runner purchase, inside of the hawse-hole; but this is a very bad purchase, as the friction and the short nip in the hawse act very much against it. In breaking a heavy anchor out of stiff ground, I have found putting on a fourfold tackle, in place of a single jigger, to facilitate heaving it up very much, as this purchase helps to heave round the windlass. The greater the pressure, the more, consequently, the friction

acts against it. Rollers inside as well as outside of the hawse holes, assist very much in heaving up a heavy anchor.

On starting the Anchor in a heavy Sea.

When lying to anchor in a gale of wind, when there is a heavy sea, great danger is to be apprehended from the anchor's jumping out of the ground. A good scope should, therefore, be given in time to avoid this accident; for if it jump out of the ground, particularly if the ground be stiff, the clay adhering to the fluke will prevent its taking hold afresh.

Information concerning Port Passage.

Port Passage is very difficult for strangers to find. It is very narrow, and is so completely sheltered from all winds, that during the heaviest gale, a cable's length within its entrance it is as smooth as a basin. It lies about two or three miles to the eastward of St. Sabastians.

As soon as a ship arrives at the entrance of this port, a number of large boats come off, to assist her in getting in, bringing with them hawsers, the ends of which are fastened to the rocks, and which serve as guest-warps. These they take on board the ship, taking in the slack, as you run in, to prevent her being driven back by the eddy winds.

In 1802, I was in the ship Orion, of Philadelphia, from Rochelle bound to this port; and when within 4 or 5 miles of it, it blowing a heavy gale, directly on shore, I came up with eight large ships, under close reefed topsails, foresail, reefed mizen, and main, mizen, and fore topmast staysails. They did not know the entrance of the port, but followed me, when I ran in, and all except one succeeded, and arrived safely. The other ship had arrived in the entrance, and the boats from the shore had passed a hawser on board of her; but the eddy winds from the rocks took her aback, parted the hawser, and drove her off to a considerable distance. She let go five anchors, which did not reach the bottom until 50 fathoms of cable were paid out. By these she rode all night, so near the rocks, that the spray from them flew on board. The next morning, it being moderate, twenty large boats went out, towed her off shore, and brought her in. Three of her cables had been entirely cut off by the rocks, and the other two were much damaged. The captain of this ship informed me that the heaviest of the wind came off from the rocks; which deceived him for a time into the belief that the wind had shifted. But he at length found it was but the eddy wind. These were French government timber ships, about 800 tons burthen, called gabbards, flat-bottomed.

Information concerning St. Sebastians.

St. Sabastians is a very open bay. A vessel lying there must have, in some cases eight, but never less than six anchors out; two from the stern, two from the bow, and one from each beam. The anchors and cable necessary for mooring are large and expensive. Ships are supplied with them from the shore, for the use of which an established price is paid. Charges are also made for all chafes which they sustain while in use; which damage is estimated by rope makers, who take special care to rate it high enough.

When you receive the cables, you are allowed to mark their old chafes; but as they are not taken up till your ship is under way going out, the boatmen, as I am informed, cut off the spun yarn which has been placed as marks of former chafes; and the old chafes are by this means paid for, as well as the new, by every ship that uses them.

On the Gibraltar Road.

In Gibraltar Road vessels lay in a line, extending from Gibraltar westwardly; because a large space of the bay on the inside of this line is too shoal; and, at a very little distance from the off side of the shipping, the water is too deep to anchor in. I have frequently known ships to run aground in this inside space, in endeavouring to obtain a clear birth. The least reflection would have informed their commanders that there must be some substantial cause for vessels lying further off. But on the off side, vessels running in have sometimes cast anchor, and veered out their cables to the bitter end, without reaching the bottom.

In running in to anchor at this place, in 1817, in the ship Mount Vernon, of Philadelphia, my second mate, in heaving the lead in seven fathoms water, by mistake mentioned seventeen fathoms.* Intending to come to with the ship's head off shore, and on hearing this, apprehending I was too near the verge of the bank, I had the ship wore round in shore, among a crowd of shipping, to my disadvantage.

There is a constant current running through the Gut of Gibraltar into the Mediterranean, which is occasioned by the water being warmer in the Mediterranean than in the Atlantic Ocean, and by its evaporation, the water runs from the Atlantic into it, to seek its level. The current runs 3 and 4 knots through this Gut, but weakens as it ascends the Mediterranean, till it arrives as high up as Cape de Gat, where there is no current, as I have experienced at different times.

* Seventeen fathoms water in Gibraltar Roads, is near the edge of soundings.

Great caution is necessary for ships from the westward bound into the Mediterranean, at the approach of night, and when drawing near this place, for if a ship should heave to in a dark night, without making good allowance, in all probability she would be carried before daylight to the southward of Cape Spartel, (where the current divides,) and be imbayed where with a westerly wind it would be difficult to beat out. By neglecting the precaution as above, several vessels have been lost on the coast of Barbary.

Management of a Ship out of Trim, in a River.

If a ship be too much by the stern and beating in a narrow channel, making short tacks, and with light winds, it will be difficult to stay her. In such case, the boats ought to be got out to assist her in staying. After she is about she will fall broad off; and by this means be a considerable time coming to.

The head yards are kept square, the jib and fore topmast staysail flowing. But if she be too much by the head, after she is about, she will fly to. The head sheets are hauled aft as soon as possible, and the head yards are braced sharp up: notwithstanding this, she may come in the wind, may be boxed off, but by this means lay aback, and perhaps drift aground. By not paying proper attention to their trim, many vessels have got ashore, in narrow channels and light winds.

Remarks on the Trim of a Ship at Sea.

It is astonishing how very particular some persons are in having large sails to their vessels, to make them sail fast, and also in carrying a crowd of sail to make a short passage, and so little regard is paid to the trim of the vessel. It may sometimes happen that a vessel being but a few inches out of trim, will make a difference of all the light sails in her sailing—this is more sensible with a vessel that has a short floor.

Remark. Being under convoy, in the brig Sylph, of Philadelphia, and coming to anchor in the Great Belt, it blowing a heavy gale, and being obliged to veer both cables out nearly to the bitter end, the next day moderate, the fleet got under way, the cables lying on the main deck, which brought the vessel by the head about three inches out of her trim. A vessel which was in the fleet, and which I could spare my top gallant sails to the preceding day, now could spare me her top gallant sails. Perceiving the cause, I had the cables coiled down in their birth, and the Sylph sailed as before. If a sharp vessel, it is still more sensible. The Sylph was sharp built.

A vessel being in proper trim before she sails out of port, if by any means she become out of trim, it may be adjusted by

contriving a level, such as a trough, and putting it in one particular place in the ship, and putting a certain quantity of water in it when the ship is in trim, and having it marked where the waterline comes, then by putting exactly the same quantity of water in it, when there is a smooth sea, the ship by these means may be kept in trim. This method is preferable to putting water on deck. The former method I have found effectually to answer the purpose. Care should be taken always to put the same end of the trough forward.

The only exact method of finding a vessel's trim, is by sailing in company with others that sail about equal. For by sailing with others that sail much faster or slower, the trim cannot be so well ascertained.

I have noticed an absurd practice at sea which prevails among navigators, of keeping their ships, when in the middle of the wide ocean, as close to the wind as possible, with the sails as sharp trimmed as they can make them, which prevents them from going above three or four knots an hour, whereas by keeping their ships a point or two from the wind, they would be enabled to carry more sail, and make little or no lee way, and be going eight or nine knots.

On Heaving Heavy Strains.

When a heavy strain is to be hove by a number of crabs or capsterns, their barrels ought to be of the same dimensions, and the tackle falls all of the same size, or you cannot heave an even strain.

On Pitch Pine Spars.

Virginia pitch pine spars, that are made of trees from which the turpentine has been extracted, lose their substance, and soon decay. I once had a foremast in a schooner, made of such wood, which broke a few feet above deck, with very little strain. The heart of the mast, which was about seven inches in diameter, was decayed entirely to dust.

On Using Black Varnish.

Nothing is more destructive to spars than black varnish. It will raise a shell, an inch thick round a spar, and separated a little from it. The water then entering the rents in this coat and surrounding the mast, rots it. Black or other coloured paint is, therefore, preferable to be used on masts.

On Gammoning Bowsprits.

The bowsprit gammoning should pass through a mortice in the cut-water, under the cheeks, for if it should pass through a

heart which is bolted through the cut-water, it is apt to break or draw; and thus the bowsprit be endangered, and the foremast perhaps, if there be not sea room to keep before the wind, until the damage be repaired.

In the ship Mercury, from Philadelphia bound to Bordeaux, in 1806, the bolt of the heart through which the gammoning passed drew; so that I was obliged to bear away before the wind, to save bowsprit and foremast until I had time to fit another. Had the shore been close under my lea, and the sea high, I could not have done this, and the consequence would probably have been the loss of both.

On Hawse-holes Steeving.

A cable, with a long scope out, may be damaged by the upper part of a hawse-hole that steeves much—which is often the case. On this account my cable had nearly suffered great damage in 1807, in a gale of wind, while lying in the ship Mercury, in Basque Roads.

Necessity of Nailing Boats afresh.

In a very short time the nails in a boat become rusty, when fresh nailing is necessary: from neglecting which much suffering has been experienced. I am of opinion that if Captain Riley had taken this precaution, he would not have fallen into the hands of the Arabs. He says, in his narrative, that his vessel being ashore on the coast of Barbary, he pushed off the boat, but that her nails were so rusty that the plank bursted off. He was, therefore, constrained to remain by the wreck, and was soon after made captive.

On Sheathing.

After the copper on ships' bottoms is worn out, it is frequently replaced by wooden sheathing, nailed on with iron nails; but this is in the highest degree dangerous, as the copper water remaining in the vessel, which is continually kept up by the copper bolts impregnating the water in the hold, will destroy the nails of the sheathing, and cause it to drop from the bottom; at least such has been the case with many vessels. And even if such a vessel be iron bolted, the impregnation of the water in her hold from the copper on her bottom, and its nails, will have nearly the same effect. To provide against such effects in the first instance, the sheathing nails should be copper; and in the second, the sheathing should be fresh nailed the first time the vessel is hove out.

Sheathing nails of copper are cheapest in the end; for if they be of iron, some fresh ones must be driven every time she is hove out, as they very soon decay in salt water.

On Nailing Copper with Wooden Mallets.

It is usual, in coppering a vessel, to drive the nails with mallets of hard wood. But when these become worn and indented in the centre, they will not drive the nails home, and they are thus left partly sticking out. In such cases the cable often drags them entirely out, which besides damaging it, causes the copper to fall from the bottom; impedes the vessel's sailing, &c. Nails should therefore be drove with hammers faced with iron, such as are used by shoemakers, by which means these evils will be avoided.

On Spiking a new Ship's Deck.

In spiking a new ship's deck, the spikes ought not to be drove hard home, as is generally done, because this bruizes and brooms the plank, and admits water, which will rust the iron. This rust will afterwards come out, leaving a hole round the head of the spike. Whereas if the spike be not driven quite down, and afterwards punched, the plank round the spike will remain sound as long as the ship lasts.

Keeping every Seam and Rent tight

Is a great preservative of the timbers. The lower deck seams ought to be always kept tight, if it be only to prevent the water's damaging the lower deck beams.

Importance of Composition Chambers in Pumps.

If a ship should leak much, so as to require the pumps to be much used, and its chamber should be of wood, it will become so much worn that a spear box which will enter the upper part of the pump will be too small to fill up the chamber; and the pump will not therefore deliver water.

I experienced this effect in the ship Orion, on my passage from Philadelphia to St. Sebastians loaded with Indian corn. In order to remedy it I had canvass sewed up, in the form of a hose, about sixteen inches in length, which was put over the upper box; one end being woolded on the score of the box, and the other end tabled with grummet holes. Through these holes marline or spunyarn was rove, and made fast to the spear, about six or eight inches above the upper end of the hose. The hose, in the first place must be sufficiently large, when swelled full of water, to fill the chamber. Its lower end must be therefore plaited on the score of the spear-box. These things being done, the pump delivered water as well as ever.

Some remedy this defect in the pumps, by cutting a piece out of the middle of the spear, and, leaving out the piece, welding the remaining parts together. By this means the box is made to work, in the chamber above the place where it is worn, and thus deliver the water freely. Care should be taken, in applying this remedy, that just so much of the spear be cut out as will allow the box to work immediately above the part which is worn. Captain Stephen Lewis, of Philadelphia, found this to answer extremely well. Mr. Thomas Patterson, of Philadelphia, block and pump maker, informed me that he was called on to ream the pumps of a vessel, which had arrived in a leaky condition; but preferred this plan as more expeditious, as delay would be attended with great damage to the cargo. Much of the cargo had been previously damaged by the water which the vessel had made, which might have been avoided, if her commander had been acquainted with either of the above remedies; by the ignorance of which I doubt not many vessels have suffered very material injury, and some even total loss. Without it I myself would have been in great peril.

I think the use of the hose the better remedy. Before being put on the spear box they ought to be well greased; two or three of which would carry a leaky vessel across the Atlantic ocean.

On Salting Ships.

All seamen are acquainted with the importance of salting ships, to which very particular attention is usually paid by them. Yet they in general neglect a very material part of this precaution, that of salting between the timbers round the bow, and this is very strangely omitted, as these timbers are the first that rot. The reason they assign for this omission usually is, that these timbers are too close together. But this is a mistake: salt may easily be introduced between them; and ought never to be neglected, as it is at least as necessary there as any where else.

Salting is certainly a great preservative of the timber and plank. It destroys all that acid and astringent juice which is in the wood, and which is so destructive, when confined from the air; besides, the salt being of a cold nature, keeps the wood cool.

On Secret Leaks.

Constant or secret leaks are often occasioned by a natural shake, which existed in the tree before it was worked into a keel, a stem, or stern-post, &c. A leak of this kind is difficult

to discover, as on the outside it does not appear larger than a rent, but communicates with a cavity in the middle, which is not perceived and not suspected, and this again to an opening on the inside, much larger than that on the outside. I commanded a vessel three years which had a private leak, that baffled all my vigilance and research, until, by chance, I one day perceived a large rent in the stem, just above light water mark. I pushed into it a small thin piece of chip, which dropped down inside. I was thus led to suspect this to be the leak. I therefore caused it to be cut in about two inches, where I found it to be quite hollow, and communicated to a large rent on the inside. A graving piece being put in this place, on the outside, rendered the vessel afterwards perfectly tight.

I was at St. Sebastian's in Spain, in the ship Orion of Philadelphia, in 1802, when a Spanish ship was hove out, for the purpose of searching for a leak that was supposed to be somewhere near the keel. This was a constant leak, which had existed from the time the ship was built, which was a period of eleven years. My consignee, who was the owner of the ship, communicated this fact to me, while the ship was keel out, in the mole. I accompanied him on the stage, and searched all the rents along the keel, until I found one which I thought suspicious; and on its being cut in with a chisel, proved to be the leak; being similar to that above mentioned; and in like manner, a graving piece rendered it perfectly tight.

All ship carpenters know the nature of these kind of shakes, but cannot be expected to cut the keel, stem, or stern-post at the appearance of every rent.

When taking in cargo, care ought to be taken to sound the pump often, as a vessel may become leaky above water, particularly in warm weather, by the drying of the seams; in which case the cargo may be injured, before any such thing is thought of.

Copper Dross Ballast

Ought never to be taken in, in iron fastened vessels, as it will impregnate the water in their holds with its pernicious properties, and thereby destroy the iron in the vessels' bottoms.

On Stowage and Evaporation.

Particular attention ought to be paid in stowing delicate goods near the deck, at all times, more particularly on going from a warm to a cold climate; as the air in a ship's hold would continue much warmer than the exterior air would be in this case. The vapour from the bilge water in the ship's

hold is therefore continually rising, and ascends to the ship's deck, the coldness of which condenses it, and it falls down, in the form of rain, and thereby, without due precaution, damages the goods. But this is not the case while a vessel either continues in the same temperature, or goes to a warmer climate; for in either of these cases the vapour is absorbed by the deck.

On Wood Donnage.

Care should be taken to use for donnage only such wood as is perfectly dry; for it often happens that wood used for this purpose has the appearance of being dry; but after being heated by close confinement in a ship's hold, moisture evaporates from it, and perhaps damages the goods near it. Such wood, therefore, ought never to be stowed among any damageable cargo.

Green Staves in Water Casks.

All water casks ought to be made of well seasoned stuff; for if it be green, the acid which is contained in this wood will spoil the water; will render it disagreeable and unwholesome. Particular attention ought to be paid to this, in fitting out for long voyages, as water taken in such casks will subject the crew to scurvy and other disorders.

Wholesome food, and cleanliness, are preventatives, in some degree, of scurvy; but plenty of good water is a complete preventative.

On carrying a Cargo of Fruit, &c.

A vessel carrying a cargo of fruit, such as raisins, or other delicate articles, should have several holes, both in the forward and after bulk-heads, so as to admit a current of air through the hold; for if the hold be kept quite close, raisins will sweat, as it is called, and afterwards, when exposed to the air, will cand, and thus lose half their value. Vermicelli also requires a current of air. There are besides, many articles which require the same treatment, which every shipper ought to notice.

I made a voyage in the schooner Julia, captain Davis, from the isle of St. Vincents to St. Johns, Newfoundland, the bulkheads of which vessel were of gratings, for the purpose of giving her cargo (codfish) sufficient air to preserve them from spoiling. Vessels which trade between the West Indies and Newfoundland, have usually the same kind of bulk-heads.

To find the Solid Contents of Packages.

A square piece of board, or other substance, 12 inches long and 12 inches broad, is one square foot; and being 12 inches each way, 12 multiplied by 12, gives 144, the number of square inches in a square foot. Then, if 12 of such boards be laid closely one on the top of the other, they would make one solid or cubic foot, and would contain 12 times as many square inches as is contained in a square foot, viz. 1728. So that it is plain, if the length, breadth and depth of any box, package, or any other compact article, be taken, reduced into inches, and multiplied into each other, and the last product be divided by 1728, it will give the quantity of solid feet contained in it. But if there be any remainder from this division, divide that by 144, which will give the number of odd inches, counting 12 to a solid foot. Forty solid feet make one ton of measurement goods.

Example of Measurement.

Suppose a package be in length 5 feet 6 inches, in breadth 4 feet 2 inches, and in depth 2 feet 6 inches, what are its solid contents?

ft.	inches		
5	6	is	66 inches
4	2	„	50
			3300
2	6	„	30

ft. inches
1728)99000(57 3½ solid contents.
8640
12600
12096
144) 504(3 inches.
432
72 equal ½ inch.
144

If a package be in length 4 feet 2 inches, breadth 3 feet 6 inches, and depth 2 feet 4 inches. Required the solid contents.

```
ft.  inches
3    6       is     42  inches
4    2       "      50
                   ----
                   2100
2    4       "      28
                   ----
                  16800
                   42
                  ----- ft. inches
            1728)58800(34 0⅓ solid contents.
                  5184
                  ----
                   6960
                   6912
                   ----
              144)  48(0
                   ----
                    144 equal ⅓ of an inch.
                   ----
```

The same by duodecimals,* a very easy rule, and easily attainable. It has the recommendation of being shorter than the foregoing method of calculation.

```
     ft.  in.
      4   2
      3   6
     ------
     12   6
      2   1
     ------
     14   7   0
      2   4
     ------
     29   2
      4  10  4
     ----------
 ft. 34   0  4
     ----------
```

To measure Boards.

Multiply the length in feet, by the width in inches, and divide by 12: the quotient will be the number of feet. But if the

* See the rules for working by duodecimals.

length in inches be multiplied by the breadth in inches, to find the number of feet, divide by 144.

To find the Solid Contents of Casks.

Find the mean diameter of the cask, by taking the mean of the bilge and head diameter. Then multiply the mean diameter, in inches by the length of the cask in inches—and again, multiply this product by the mean diameter. Deduct one-fifth of the sum so found, for the roundness of the cask; and reduce the remainder to feet and inches, by the rule for measurement of packages, as in the following example:—

If a cask be in length 3 feet 9 inches, its head diameter 2 feet 6 inches, and its bung diameter, 2 feet 10 inches. What are its solid contents?

length 45 — head diameter 30 inches.
mean diameter 32 — bung do 34

90 — 2) 64
135

1440 — mean diameter 32
diameter 32 again to be multiplied.

2880
432

46080
deduct 9216 one-fifth for its roundness.

1728)36864(21 ft. 4 inches—contents.
3456

2304
1728

144) 576(4
576

In measuring a cask, in order to ascertain the freight by the ton, the greatest diameter must be taken, which is at the bilge.

It is generally supposed that one-third of the circumference of a circle is its diameter; but it is not exactly so; the circumference is to the diameter as 22 is to 7, or as 355 is to 113. If therefore any body, whose diameter is sought, be of a taper figure, it should be girted at both ends—and the circumferences

of both added together. Then this sum being divided by 2—say as 22 is to 7, so is the product of this division to the diameter required; which will show the mean diameter—or if the figure of the body be triangular, or irregular, its diameter may be ascertained in a similar manner. If its figure be globular, girt it, and multiply its circumference in inches by 3—and then apply the rule as above—as 22 is to 7, so is the sum found to the solid contents of a cube or square solid body of the same diameter. Then, to reduce it to the contents of a globe, say as 21 is to 11, so is the last sum found to the solid contents required.*

Examples of the diameter deduced from a known circumference.

Suppose the circumference of a circle be 120 inches,

Then as 355 : 113 : : 120
120

355)13560(38 and ½ nearly—diameter required.
1065

2910
2840

70

355

Again by another rule as 22 : 7 : : 120
7

22)840(38 and ½ nearly.
66

180
176

4

22

Thus it is seen that the diameter of a circle 120 inches in circumference is 1½ inch less than onethird.

* See an example of this mode of measurement under the head GUNNERY; in this work.

Gauging.

A rule for gauging being given in different books, I shall only give a rule to obtain the number of gallons a vessel contains, by cubic measurement.

Find the cubic contents of the inside of any vessel, in cubic inches, and divide by 231 :—the quotient will be the number of gallons in wine measure.

Example.

Of a cask, whose length is 43 inches, head diameter 27 inches, and bung diameter 30 inches.

$$\left.\begin{array}{r}\text{Head } 27\\ \text{Head } 27\\ \text{Bung } 30\end{array}\right\}\text{ added.}$$

Divide by 3)84

28 mean diameter.

$$\left.\begin{array}{lr}\text{Length of the cask} & 43\\ \text{Mean diameter} & 28\end{array}\right\}\text{ multiplied.}$$

344
86

$$\left.\begin{array}{r}1204\\ 28\end{array}\right\}\text{ multiplied again.}$$

9632
2408

33712
One-fifth 6742 deducted for the roundness.

231)26970(116¾ gallons.
231

387
231

1560
1386

$$\left.\frac{174}{231}\right\}\text{ equal to about three fourths of a gallon.}$$

The above is sufficiently correct to determine the capacity of water casks on board of a ship. I have compared the results of this rule with casks which have been gauged by Gunter's scale, and have found them to differ only from one to one and a half gallon.

As it is necessary, on fitting out for long voyages, to know what quantity of water is on board, and as it is generally in casks of various sizes, this rule may be useful in ascertaining its quantity.

Duodecimals,

Are so called because they decrease by twelves from the place of feet towards the right. Inches are marked thus (′): the next division is called seconds, and marked thus (″); the next is thirds, marked thus (‴), &c.

Duodecimals are used for finding the contents of ceilings, walls, floors, the sheathing of ships, the tonnage of ships, the cubic contents of casks and packages, &c.

RULE FOR WORKING.

1. Under the multiplicand, or sum to be multiplied, write the same names or denominations of the multiplier: that is, feet under feet, inches under inches, &c.

2. Multiply each term in the multiplicand, beginning at the lowest, by the feet in the multiplier, (or if there be no feet in the multiplier by its highest denomination) and write each result under its respective term, observing to carry a unit for every twelve, from each lower denomination to its next higher.

3. In the same manner multiply every term in the multiplicand, by the inches in the multiplier, and set the result of each term one place further towards the right of those in the multiplicand.

4. Proceed in like manner with the seconds, and all the rest of the denominations, if their be any more; and the sum of all the lines will be the product required,

Or the denominations of the particular products will be agreeable to the following rule:

Feet multiplied	by feet give feet,
Feet	by inches give inches,
Feet	by seconds give seconds,
Inches	by inches give seconds,
Inches	by seconds give thirds,
Inches	by thirds give fourths,
Seconds	by seconds give fourths,
Seconds	by thirds give fifths,
Seconds	by fourths give sixths,

Thirds multiplied by thirds give sixths,
Thirds by fourths give sevenths,
Thirds by fifths give eighths.

Or, in general, it may be understood thus :—where feet are concerned, the product is of the same denomination as the term by which the feet is multiplied. Where feet are not concerned, the name of the term will be expressed by the sum of the strokes above the particular terms multiplied into each other—being added together as in the following instance : multiply 2'' by 3''' ; the result is 6''''' : the sum of the strokes of the terms multiplied being five.

Required the contents of a ceiling, viz :

	F.	'	''	'''	''''			
	33	2	9	2	4	long.		
	2	10	3	0	0	broad.		
	66	5	6	4	8	''''		
	27	7	9	8	11	4	'''''	
		8	3	8	3	7	0	
Feet,	94	9	7	9	10	11		answer.

Required the contents of a floor, viz :

	Ft.	'	''			
	7	8	6	broad.		
	10	4	5	long.		
	77	1	0	'''		
	2	6	10	0	''''	
		3	2	6	6	
Feet,	79	11	0	6	6	answer.

Proportions of the Spars of Merchant Ships.

LENGTH OF SPARS.

Mainmast, equal to two and a half times the ship's beam.

Foremast, eight ninths of the mainmast.

Mizenmast, five sixths of the mainmast.

Bowsprit, two thirds of the mainmast, one third of which ought to be in board.

Main topmast, three fifths of the mainmast.

Main topgallant mast, half the main topmast, exclusive of the pole, which is generally half the length of the topgallant mast or a little longer.

Fore topmast, three fifths of the foremast.

Fore topgallant mast, half the length of the fore topmast, exclusive of the pole, which is half the length of the topgallant mast.

Mizen topmast, three fifths of the mizenmast.

Mizen topgallant mast, half the length of the mizen topmast, and the pole half the length of the topgallant mast.

Jib-boom, the length of the bowsprit, two thirds of which length is rigged without the bowsprit cap.

Main yard, twice the ship's extreme breadth.

Main topsail yard, two thirds of the main yard.

Main topgallant yard, two thirds of the main topsail yard.

Fore yard, seven eighths of the main yard.

Fore topsail yard, two thirds of the fore yard.

Fore topgallant yard, two thirds of the fore topsail yard.

Royal yards, two thirds of the length of their respective topgallant yards.*

Crossjack yard, same length as the main topsail yard.

Mizen topsail yard, the same length as the main topgallant yard.

Mizen topgallant yard, two thirds of the mizen topsail yard.

Spritsail yard, five sixths of the fore topsail yard.

Remark.—Some have the spritsail yard the length of the fore topsail yard, or nearly so. If it should be much shorter, the jib sheets will chafe against the spritsail braces.

Spanker boom, the length of the main topsail yard. It is, however made, sometimes longer, sometimes shorter, according to fancy.

Mizen gaff, two thirds of the spanker boom. Liable to the same variation.

THICKNESS OF SPARS.

Masts.—It has been customary to allow for every three feet of the mainmast's length one inch of diameter in the partners: and for every inch of diameter at the partners, nine tenths of an inch of diameter in the middle, between the partners and the extremity of the head, and the two thirds under the hounds, and all other masts in the same proportion; and with these proportions masts have been usually made. I am, however, of opinion, that one and a quarter inch of diameter in the partners for every three feet of length is much better.

Yards.—For every four feet of their length allow one inch of diameter in the slings, and half that diameter within the squares, at the yard arm.

BREADTH OF TOPS.

Main top, half the ship's beam.

Fore top eight ninths of the main top.

* These dimensions of the yards include the yard arms.

Rule for Placing Masts in a Ship.

Take the ship's length, from the after part of the stem to the fore part of the sternpost, and divide it into sevenths. Place the foremost one seventh of this length from the stem; the mainmast three sevenths from the foremast; the mizen mast two sevenths from the mainmast; and then there will be one seventh distance between the mizen mast and the sternpost.—This rule is for a full built ship. It must therefore be varied when applied to vessels that are sharp, and the stem and sternposts of which rake. The foremast must accordingly be placed further aft, the mizen mast further forward, and the distance between the masts proportionably regulated.

Anchors.

In regulating the necessary weights of the anchors, five hundred pounds is allowed for every hundred tons of a ship's measurement, for a merchant vessel. Ships above five hundred tons do not, however require so great a proportion.

The anchor stock must be the length of the shank and half the diameter of the ring, and for thickness, one inch is allowed in the middle to each foot in length, and reduced to half that at the ends.

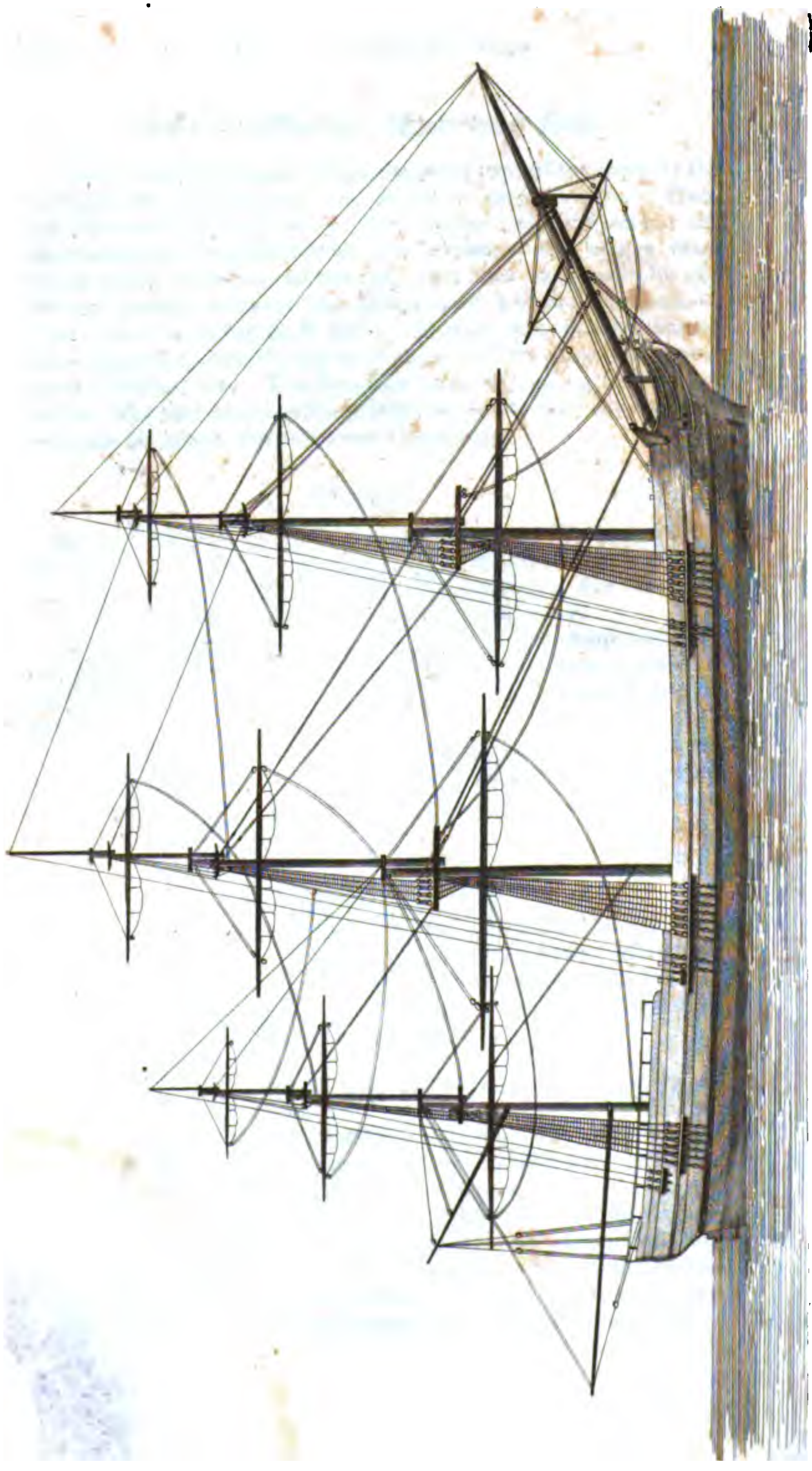
The channels of a vessel ought to be placed so that the foremost dead-eye be either abreast of the mast, or a little more aft. By this means the foremost catharpins will be prevented from binding against the mast.

Cables and Cordage.

The necessary size of cables is thus ascertained:—for each foot of half the extreme breadth of the ship's beam, allow one inch of circumference for the best bower cable, and for the smaller bower, something less. Thus a ship of thirty-two feet beam will require a sixteen inch cable, &c. &c.

To Cut and Fit Standing and Running Rigging.

The annexed plate represents a ship with the yards hoisted up. From this representation a scale of any ship may be made, by which the running rigging may be cut to its proper length, before it is rove, and also by which a gang of standing rigging may be cut. Make a scale of any convenient proportion, say one tenth of an inch to a foot. Then take the lengths of the spars, and proportion them to this scale; by which means the length of a rope may be measured, and also the dimensions of



the sails, and the number of yards of canvas ascertained, in any sail.

How to Cut and Fit a Gang of Lower Rigging.

When cutting the shrouds, according to the scale, proper allowance must be made for their rising one above another on the mast-head. The shroud is put on a stretch, and the worming laid into the lay of the rope, while the rope is a little slack; the shroud must then be bowsed taught, the parsling put on with the lay, and the spunyarn put on against the lay. When serving, your left side ought to be kept next to the rope, so that you must serve a hawser-laid rope towards you, that is, you must walk backwards. The shrouds must be parsled and served two feet below the catharpings. The foremost shroud, of both fore and main rigging, and also the after mizen shroud, must be served quite down to the dead-eyes. The forward and after shroud of the main rigging of a brig, which carries a square mainsail, must be served quite down to the dead-eyes. The lower shrouds are generally wormed in the wake of the eyes, with 4, 5 or 6 yarn spunyarn, it not being so liable to cut, when the eyes of the rigging lay upon each other. The other part of the shrouds is wormed with small line. All the eyes of the shrouds must be seized of equal length; so that, by one shroud rising above another on the mast-head, the seizings will rise one above another also; and therefore be less liable to chafe against each other, than otherwise. The collar of the stay must be of such a length as will not allow the foot of the topsail to reach the mousing, when flapping. When the leather is sewed on the eye or collar of the stay, the seam must be underneath. The stay must be parsled and served about three feet below the mousing, and also in the wake of the main topmast staysail sheets, and on the fore stay, in the wake of the jib sheet. After the masthead is tarred, and the trustle-trees put on the masthead, the bolsters must be put on, having several thicknesses of canvas, well tarred. The topmast should be hung so as to have its mast-head two or three feet above the lower mast-head, and the girtline block lashed on the topmast head. In this way the shrouds may be put over the mast-head with ease. The starboard shroud is the first put over the mast-head, and the rest in succession; and of course the starboard shroud must be the first that is set up, and the rest in succession, as they have been put over the mast-head. The stay should be kept above the eyes of the rigging, and set up, until the shrouds are set up, as otherwise the collar of the stay might prevent the rigging from settling on the mast-head. After which, the eye of the stay must be laid over the back of the rigging, and the stay set up;

and the shrouds should also have another set up. This is to be done only when the rigging is fresh put over the mast-head.

It must be remembered, that the dead-eyes, with a shroud-laid rope, should be turned in with the sun, and with a hawser-laid rope, turned in against the sun. The lanyard must be so rove, that the end part will come up on the same side with the standing part of the shroud. It is best to keep the eyes of the shrouds as far aft on the mast-head as convenient; by which means, the foremost catharpin will be clear of the mast. A top ought to be got up side-ways, as that will render it more easy. In this case, the girtline blocks must be lashed on the fore and after part of the mast-head.

The following tables will furnish much useful information respecting cordage.

A Cordage table, shewing how many fathom, feet, and inches of a rope of any size under 14 inches, makes an hundred weight; with the construction of the table, and rules to calculate the weight of ropes to any large circumference.

I.	F.	F.	I.	I.	F.	F.	I.	I.	F.	F.	I.
1	486	0	0	6	13	3	0	11	4	0	1
¼	311	0	2	¼	12	2	7	¼	3	5	0
½	216	0	0	½	11	3	0	½	3	4	0
¾	158	4	1	¾	10	4	0	¾	3	3	1
2	121	3	0	7	9	5	6	12	3	2	3
¼	96	0	0	¼	9	1	5	¼	3	1	5
½	77	4	6	½	8	3	7	½	3	0	8
¾	64	1	7	¾	8	0	6	¾	2	5	11
3	54	0	0	8	7	3	6	13	2	5	3
¼	46	0	0	¼	7	0	10	¼	2	4	7
½	39	4	0	½	6	4	4	½	2	4	0
¾	34	3	4	¾	6	2	1	¾	2	3	5
4	30	2	3	9	6	0	0	14	2	2	10
¼	26	5	5	¼	5	4	1				
½	24	0	0	½	5	2	3				
¾	21	3	2	¾	5	0	8				
5	19	2	7	10	4	5	1				
¼	17	3	9	¼	4	3	9				
½	16	0	4	½	4	2	5				
¾	14	4	2	¾	4	1	2				
6	13	3	0	11	4	0	1				

The Use of the Cordage Table.

The letters I. F. F. I. at the top of the table signify *Inches*, *Fathoms*, *Feet*, and *Inches*. The first column being the girt or circumference of the rope in inches and quarters, and the other three the fathoms, feet, and inches that make up an hundred weight of such rope. One example will make it plain.

Suppose I desire to know how much of a 7 inch rope will make an hundred; find the 7 in the 5th column under I. or inches girt of the rope, and against that in the 6th, 7th, and 8th columns you find 9 | 5 | 6; which shows, that in a rope of 7 inches, 9 fathom, 5 feet and 6 inches is required to make an hundred weight: and so in a 9 inch rope, 6 fathoms makes an hundred weight: and in a 3 inch rope 54 fathoms makes an hundred weight, &c.

The construction of this table is from hence:—

A rope of 1 inch about required 486 fathoms to make up an hundred weight; and, as the superficial content of all circles are in proportion to the squares of their diameters, (and consequently to the squares of their circumferences) it will follow, that as a rope of 1 inch in circumference, whose square is also 1, has 486 fathoms to an hundred weight; 486 divided by the square of the circumference or girt of any other rope, the quotient will give the number of fathoms in an hundred weight. As for example, in a nine inch rope, 9 times 9 is 81, by which divide 486, the quotient is 6, the fathoms in an hundred weight: and so for a 3 inch rope, 3 times 3 is 9, by which divide 486, the quotient is 54 fathoms to an hundred weight, as in the table; and where there is a fraction in the division, it may be reduced to feet and inches; 6 feet being a fathom, and 12 inches being a foot.

Suppose a cable 16 inches in circumference and 120 fathoms in length.

```
    16 inches.
    16
    --
    96
   16
   ---
4)256(64 hundred weight at 112 pounds to the
  24         hundred weight.
  ---
   16
```

A table showing the Weight of any Cable or Rope of a hundred and twenty Fathoms in Length, and for every half Inch from three Inches to twenty four in circumference.

In.	C.	Q.	In.	C.	Q.
3	2	1	14	49	0
3½	3	0	14½	52	2
4	4	0	15	56	1
4½	5	0	15½	60	0
5	6	1	16	64	0
5½	7	2	16½	68	0
6	9	0	17	72	1
6½	10	2	17½	76	2
7	12	1	18	81	0
7½	14	0	18½	85	2
8	16	0	19	90	1
8½	18	0	19½	95	0
9	20	1	20	100	0
9½	22	2	20½	105	0
10	25	0	21	110	1
10½	27	2	21½	115	2
11	30	1	22	121	0
11½	33	0	22½	126	2
12	36	0	23	132	1
12½	39	0	23½	138	0
13	42	1	24	144	0
13½	45	2			

I chose to instance in a cable of the length above mentioned, because yarn set at two hundred fathoms, will, in the laying of a cable, work up or shorten to a hundred and twenty fathoms; cable laid ropes working in about two parts in five, but if it is a half cable, or a part of a cable of any other length, the weight of a hundred and twenty fathom being found by the table, the weight of any lesser part is easily found in proportion to its length.

THE USE OF THE TABLE.

The first column marked I. for *Inches*, is the thickness or circumference of the cable to every half inch from 3 to 24; the second and third, marked C. Q. for *Hundreds* and *Quarters*, are the hundreds and quarters that it will weigh if 120 fathoms in length. As for instance, suppose a cable of fourteen inches and an half; look against 14½ in the fourth column, and you find

against it in the other column, 52 | 2; which shews that 120 fathom of cable of 14 inches and a half about, will weigh 52 hundred two quarters, or 52 hundred and an half; and so in others. And any of a lesser length, will weigh in proportion.

The construction of this table is from hence, that as all cables are solid bodies, and may properly come under the denomination of cylinders; and as such the weight of cables of any determinate length will be in proportion to the squares of their circumferences. From this foundation, experience has formed this general brief rule, viz: *Multiply the thickness of the cable by itself, and one fourth of that product is the weight of* 120 *fathoms.* As for instance, suppose a cable of 12 inches, 12 times 12 is 144, the quarter of which is 36, the weight of 120 fathom of a cable of 12 inches; as you see in the table.

This table gives the utmost weight of cables of the length and size proposed, and something, though inconsiderably, differs from the foregoing. As for instance, in the foregoing table, 6 fathom of a 9 inch rope makes an hundred weight, and consequently 120 fathom should be just 20 hundred weight, but in this it makes 20 hundred and one quarter; but the difference is inconsiderable, and the cables never exceed the weight here proposed.

The annexed table will be found very accurate and useful, in which every rope was weighed, or accurately estimated.

Cables, of what thickness soever, are generally formed of three ropes twisted together, which are then called *strands*; each of these is composed of three smaller strands, and those last of a certain number of rope-yarns; this number is therefore greater or smaller, in proportion to the size of the cable required.

All cables ought to be 120 fathoms in length; for which purpose, the threads or yarns must be 180 fathoms, inasmuch as they are diminished one third in length by twisting.

The number of threads also of which each cable is composed being always proportioned to its length and thickness, the weight and value of it are determined by this number.—Thus a cable of 10 inches in circumference ought to consist of 485 threads, and weigh 1940 lbs. and on this foundation is calculated the following table:

A Table of the number of threads and weight of Cables of different circumferences.

Inches in circumf.	No. of Threads.	Weight in lbs.
9	393	1527
10	485	1940
11	598	2392
12	699	2796
13	821	3284
14	952	3808
15	1093	4372
16	1244	4976
17	1404	5616
18	1574	6296
19	1754	7016
20	1943	7772

Table shewing the comparative strength of Common and Patent Cordage.

CABLES.						SHROUD LAID ROPES.		
Common manufacture.	Patent cables of similar strength.	Size of cables recommended.	Weight of 120 fathoms, common cables.	Weight of 120 fathoms of patent cable of the size recommended.	Saving in weight.	Common manufacture.	Equal strength of patent rope.	Size recommended of patent rope.
GIRT.			*Cwt.*	*Cwt.*	*Cwt.*	GIRT.		
Inches.	*Inches.*	*Inches.*				*Inches.*	*Inches.*	*Inches.*
7	5 7/8	6 1/2	12 1/4	10	2 1/4	3 1/2	2 7/8	3 1/4
8	6 5/8	7 1/4	16	13	3	4	3 1/4	3 1/2
9	7 3/8	8 1/4	20 1/4	17	3 1/4	4 1/2	3 3/4	4
10	8 1/8	9	25	20 1/4	4 3/4	5	4	4 1/4
11	8 7/8	9 3/4	30 1/4	23 3/4	6 1/2	5 1/2	4 1/2	4 3/4
12	9 5/8	10 1/2	36	27 1/2	8 1/2	6	4 7/8	5 1/4
13	10 1/4	11 1/2	42 1/4	33	9 1/4	6 1/2	5 1/4	5 3/4
14	11	12 1/4	49	37 1/2	11 1/2	7	5 1/2	6
15	11 5/8	13	56 1/4	42 1/4	14	7 1/2	5 7/8	6 1/2
16	12 1/4	14	64	49	15	8	6 1/4	6 3/4
17	12 7/8	14 3/4	72 1/4	54 1/2	17 3/4	8 1/2	6 1/2	7
18	13 1/2	15 3/4	81	62	19	9	6 7/8	7 1/4
19	14	16 1/2	90 1/4	68	22 1/4	9 1/2	7	7 3/4
20	14 1/2	17 1/2	100	76 1/2	23 1/2	10	7 1/4	8

The preceding table is deduced from experiments made by the breaking of ropes of various sizes, with one of their ends attached to a frame suspended to a strong iron beam, moving on steel pivots; to the other end of which beam weights were progressively suspended until the ropes broke. By these means the patent shroud-laid ropes, made of *Petersburg clean hemp*, were found almost uniformly to break with a stress fluctuating between 6¾ and 7¼ cwt. per inch of their girt, in inches squared; thus a patent rope of 5 inches girt would, on an average, require 175 cwt. to break it. Common made ropes of the same hemp, and of 25 threads in each strand, broke with 5 cwt. per inch, and kept a progressive decrease, so as with about 130 threads to fall off to 4 cwt. per inch. The threads were of the common size; and the latter rope rather exceeded 8 inches girt. When strands were broken separately, the disparity between those of the common and the improved methods was much greater than in the ropes themselves. These experiments being made in the manner before stated, *no deduction from the strength given has to be made for friction*, which otherwise would have been requisite.

The duration of patent ropes in drawing coals, &c. from mines, or for other purposes where they are subject to be worn, is still greater than their superiority of strength over common rope; because, when the outside shell or coat of yarns of the latter is much worn, the whole of it gives way; the rope then lengthens suitably to the next coat, loses its form, and becomes unfit for use.

Whale lines are generally of 2¼ inches girt and 28 threads to the strand, and made from finely dressed hemp of the best quality; these lines have been found to break under resistances of between 25 and 32 cwt. equal to between 5 and 6 cwt. per inch rope; whilst lines made from the same yarns, patent laid, *and only 2 inches girt*, have carried considerably above 2 tons; so that the latter are much stronger and lighter, and, of course worthy of general preference.

To find the Tonnage of a Vessel by the United States' Measurement.

The length is taken from the fore part of the main stem to the after part of the stern-post; the beam is measured at the extreme breadth to the outside of the bends; three fifths of this beam is taken off the length, before the calculation is made; for a double decked vessel half the breadth of beam is called the depth of hold; and for a single decked vessel it is the same, except that the hold is measured at the fore part of the main hatchway, from the deck down to the ceiling along side of the kelson.

To proceed on in the calculation, after all the allowances have been made, the length must be multiplied by the breadth, and that product by the depth of hold; then divide the last product by 95, and the quotient will give the tonnage required.

Formerly the British divided by 94 for merchant vessels, and for ships of war by 100; but I have been informed that they now divide by 100 both for ships of war and merchantmen, which is the reason that they make our ships tonnage less than we do.

The ship carpenter's tonnage in Philadelphia differs from the United States' measurement. A rule staff is laid under the keel, projecting forward; a line is plumbed from the upper part of the fore part of the stem to the rule staff; the keel is measured from its after part to the plumb line, along and including the rule staff, this is called the length of keel, straight rabbit. The beam is measured from skin to skin, on the inside; three fifths of this beam is taken off the keel, straight rabbit, for the length: and the calculation, in other respects, is the same as United States' measurement; so that the carpenters' tonnage in Philadelphia will be less, according to the rake of the stern-post, &c.

The dead rise of a vessel is found by having a staff half the beam, from skin to skin, at the extreme breadth, which staff is laid even across on the ceiling, at the fore part of the main hatchway. One of the limber boards being taken up, a line is let fall from the staff to the skin, along side of the kelson, and what it measures is the vessel's dead rise; so that in order to know how sharp a vessel is, it is customary to ask how much dead rise she has.

Examples in Calculating Tonnage, United States' Measurement.

```
Length, after three fifths of the beam is deducted, 102 feet.
Beam,                                                30
                                                   3060
Depth of hold, being half beam,                      15
                                                  15300
                                                  3060
                                              95)45900(483
                                                 380
                                                  790
                                                  760
                                                   300
                                                   285
                                                    15
```

Tonnage, 483 tons and 15 ninety-fifths.

Length on deck, 102 feet 6 inches.
Breadth of beam, 30 feet.
Depth of hold, 15

```
   102.5
    80
   ------
   3075
    15
   ------
  15375
  3075
  ------
95)46125(485 50-95 tons.
  380
  ---
   812
   760
   ---
    525
    475
    ---
     50
```

Suppose a ship's length, after three fifths of beam being taken off, is 102 feet 6 inches; breadth of beam 30 feet 6 inches; depth of hold half the breadth of beam, which will be 15 feet 3 inches.

```
Length,              102.50
Breadth,              30.50
                    -------
                    5125
                  30750
                  -------
                3126.25.00
                     15.25
                ----------
               15631.25.00
              62525.00.0
             1563125.00
            3126250.0
            ----------
95)47675(.31.25.00(501 80-95 tons.
  475
  ---
    175
     95
    ---
     80
```

Or thus:

```
           102.5
            30.5
           -----
           512.5
          3075
         -------
         31262.5
            15.25
         --------
         156312.5
         625250
        1563125
        312625
        ---------
     95)47675(.31.25(501 80-95 tons.
       475
       ---
         175
          95
         ---
          80
```

What Vessels of different Classes will carry in Proportion to their Measurement.

A full built ship of 300 tons will hold 50 per cent. above her tonnage; that is, she will carry 450 tons measurement goods, calculating 40 cubic or solid feet to the ton.

A ship of 300 tons, if very sharp built, will not hold more than 390 tons measurement goods. They will hold more in proportion as they are less sharp built.

A ship of 400 tons, full built, will hold 60 per cent. above her tonnage; but if she be sharp built, she will hold about 40 per cent. on her tonnage of measurement goods.

A ship of 500 tons, full built, will hold 75 per cent. above her tonnage.

A ship of 650 tons, sharp built, will hold 50 per cent. above her tonnage.

A ship of 600 tons, full built, will hold 75 per cent. on her tonnage.

A ship of 600 tons, sharp built, will hold 50 per cent. above her tonnage; so that the larger the vessel the more she will hold above her tonnage; as a ship of 1200 tons, full built, will hold from 90 to 100 per cent. on her tonnage; and a ship of 1200 tons, sharp built, may hold from 60 to 70 per cent. above her tonnage; while a vessel of 200 tonnage, sharp built, perhaps will not hold equal to her tonnage.

THE

BEST METHOD

TO BE PURSUED BY MERCHANT SHIPS TO ESCAPE FROM AN ENEMY OF SUPERIOR FORCE.

Though a merchant ship be well supplied and fitted for a close fight, yet the commander is not obliged to fight a privateer, if he can with safety shun her: and if he should be chased, he ought to embrace every advantage that can be taken by wind or tide.

The enemy being to windward, it is best for a three masted vessel to sail quartering.

The ship chased, having the liberty of chusing her course, may steer as she pleases; but the commander, in making his choice, is to pitch upon that which answers best; which is to prolong the time, that the night may cover his escape, or he may meet with a friend to secure him. Sailing quartering is found to be the swiftest motion a ship can make through the water, when all sails draw; and the enemy is obliged to go right before the wind to come up with the chase; then he can have only part of his sails drawing, while the chase has all hers, and if the enemy sails quartering also, he must keep a parallel course with the chase, or rather his course will be inclined to windward, because his yards (as in most privateers) are squarer than merchantmen. He must bring the wind more points on the quarter, that all sails may draw; and if he pursues this method, he must at last bear down before the wind into her wake.

The conduct to be used by Merchant Ships to get to Windward.

If the enemy be directly to windward, the chase must then first sail quartering. If the enemy bear down before the wind, then she may gradually bring the wind forward till it is upon the beam: and if the enemy still bear for your wake, luff as he gains it, till you are hauled sharp and he in your wake; then

make the best of your way to windward. Here you must be cautious of tacking; for if you should be but a little distance from the enemy, and you on one tack and he on the other, you will give him the opportunity, if not of weathering, at least of getting within gun shot of you. But if the enemy steer quartering, or inclining to windward of the chase, then if he outsail you, and is far upon the quarter, bear away and get the wake upon the other quarter. If the enemy keeps his course designing to get in your wake, haul up gradually and try if you can get to windward upon that tack.

If the Chase is to Windward and beating to Windward.

Under this head the chase must be considered directly in the wind's eye, or a few points to windward. The chase being close hauled, it is evident that the enemy cannot lie in her wake, and it may be assured that his conduct will be to keep a parallel course, or sail with his contrary tacks on board till he fetches her wake.

Suppose, at first sight of the enemy, the chase keeps close to the wind, with her larboard tacks on board. Then suppose the enemy steers with his starboard tack on board, designing to fetch the chase's wake. In this case tacking will be of no avail, there being sea room enough and no current, even if she sail as fast upon one tack as the other, she will not make the chase longer, but rather shorten it; for each time she tacks she will lose as much way as she would have run miles in the time of tacking: besides, a ship does not recover her way as soon as she is about.

In not tacking, this disadvantage is not only avoided, but you are in the way of many considerable advantages; for should a calm happen, the chase is so much further from the enemy. If the wind shift, the weather prove thick, or night come on, she would lose sight of him the sooner; and lastly, just as the enemy is in the chase's wake, she may bear away a point from the wind. This may not be at first noticed by the enemy, who will still keep his luff: by this means the chase will head reach on the enemy; and should the enemy perceive it, he will be nothing the better for the discovery; for being to leeward of the chase's wake he must sail close hauled to fetch her, while the chase steers a point from the wind. But should the enemy keep a parallel course with the chase, then the commander's best plan will be to tack immediately; and if the enemy tacks, as soon as the chase is about, and gains on her, then the commander must prepare for a fight, and discharge his duty to his country.

The best way for merchant ships to fight will be mentioned hereafter.

The Enemy a few Points to Leeward.

If the chase be a few points to windward of the enemy, and if the chase intends to beat to windward, she may sail on the tack that best suits. There is no difference, unless she sail better on one tack than on the other.

If the Chase be to Windward of the Enemy, the Conduct the Chase must pursue if he wishes to to get to Leeward.

If it is the wish of the chase to get to leeward of the enemy, it ought not to be done till the enemy is in the chase's wake; for if this be attempted before the enemy is in her wake, he will be running athwart her fore foot, and be sooner within gunshot; and when the enemy is in her wake, if she bear down at once, he may be within gunshot before you get to leeward of him; therefore it will be best not to bear away quartering till you have allured the enemy into your wake with the wind abeam.

To Avoid the Enemy's Boats Boarding a Vessel lying in a strong Tide's Way.

In the year 1806, in the river Bordeaux, near the mouth, there were lying two French corvettes, the lowermost one a ship, and the uppermost one a brig, two miles distant from each other. A British ship of war, being off the mouth of the river, sent in a number of boats, well manned and armed, to attack them. The boats were in two divisions. One division succeeded in capturing the ship; but the captain of the brig, perceiving the intention of the second division, and his vessel riding to a strong flood tide, previously had the ebb cable slacked out, and waited until the boats were near him, when the helm was put hard over, which gave the vessel such a broad sheer, that the boats failed in boarding her, and were obliged to pull in shore, before they could get to the other ship, (the prize.) The French corvette brig afterwards went farther up the river, for the purpose of keeping out of danger. (*The tide in Bordeaux river runs five knots per hour.*) If a good look out had been kept on board the ship, they might have avoided being boarded and captured, and the lives of many of her crew saved. I arrived at Bordeaux a short time after this took place, where I received this information. A good look out is necessary; and

the commander of a ship of war is justifiable in having all hands at quarters on the approach of a small boat, where there can be the least suspicion, for many reasons.

On having Springs on the Cables to Present a Ship's Side to an Object ahead, when either Wind-rode or Tide-rode.

Where there is a strong tide, letting a vessel come broadside to the tide, by a spring, may carry her adrift.

Where the tide does not run too strong, putting a spring on the cable is useful, for the purpose of bringing the vessel broadside to the tide, so as to bring the guns to bear on the enemy. This is performed by carrying the end of a good hawser or stream cable from the quarter, and having it made fast to the cable; and by making fast the hawser at the quarter, and paying out the cable, the vessel becomes broadside to tide. In time of war, in a tide's way, a hawser should be always on the cable, for fear of a surprise. I was on board the brig Revolution, of fourteen guns, Captain Stansberry, in the revolutionary war, lying in Wilmington river, North Carolina, when two row gallies from Charleston, then in possession of the British arms, stood up the river, for the purpose of attacking our vessel. As soon as they came within gun-shot they commenced firing; but we adopted this expedient, by which we succeeded in beating them off, The gallies were small, and, of course, their bow guns were short. If they had been large, with long heavy bow guns, they might have sunk our vessel, by keeping out of reach of our guns, which were short six pounders.

Advantage to be Taken among Shoals.

When the chase is among shoals, and neither advantage of sailing nor of currents can be taken, if the vessel be of a light draft of water, the commander may draw the enemy out of his knowledge; and by this means escape, if not run the privateer aground.

Stratagems to be used in Escaping from the Enemy on Soundings, if not too deep Water for Anchoring, on a Lee Tide or in a Calm.

If the enemy should be too powerful for you, on soundings let go an anchor suddenly, at the very point of the enemy's vessel boarding you, which he, not at all suspecting, nor being prepared to do the like, if on a lee tide, or calm, will suddenly

come to leeward of you; so that he will not be able to recover your vessel, nor get to windward again, until the turn of the tide, in which time your retreat may be favoured by some lucky event.

In the night it is not difficult to lose an enemy, especially in a tide's way, which may be done by clewing up the sails and letting go an anchor at once. Clewing up your sails will render you less visible, and bringing up at once will make you totally invisible; for the enemy, on a sudden shooting ahead, loses sight of the chase, and will not know what course to steer to recover her. In doing this the commander must take care, in anchoring, that he does not board his enemy. But, out of anchorage, only clew up the sails and heave to at once; and if you should be chased before the wind, run with the wind abeam; or, if chased with the wind abeam, either go before the wind some time, or bring to the other way; or, if close hauled, and the enemy to windward, haul to the other way, and sail with the wind quartering or before the wind. In all these cases the commander must be cautious not to get in the wind's eye too soon; because it being commonly clear to windward, you may see further.

How to proceed after having run a Ship on Shore.

The running a ship on shore is hazardous, as she may thereby bilge, so that the conduct to save her may lose her; yet it is better to lose her than to enrich your enemy, with the loss of your liberty. Though it is a thing a commander ought to consider, and not carelessly proceed to: for if he should run her on shore, at the sight of the enemy, when he is in a condition to engage, he violates his duty to his country, the interest of his owners, and the trust reposed in him; consequently he loses his reputation with his employ: but if the enemy be superior, and he has no hopes of defending his ship by fighting, or of escaping, it is then prudent to run her on shore, if there is no risk of lives, and bravely to defend her there.

But if you foresee a strong and numerous attack by ships of war, the best way is to take to your boats: but first you may make great fires in the forecastle, steerage, and cabin, in half hogsheads filled with ballast. Into the fires put old shoes, clothes, wet oakum, and whatever will make a smoke; shut all up, letting the smoke come up through cracks, loopholes, &c. or through the port holes, if the guns be carried between decks. This will intimidate the enemy from plundering your ship, or setting her on fire, especially if your powder chests and granadoes upon your quarters be all primed, and your matches laid, that they may fire at different times. Or, to prevent the ene-

my's getting her off, you may sink her; or lay trains, with good firelocks to them, charged and cocked, and to their triggers tie pieces of marline, which may be fastened to the scuttles or doors, so that when the enemy pulls them open they may pull down the triggers, and blow up the ship; but it must be observed, that some weight must be tied to the piece, or some how made fast, or the musket will not remain stationary. Several muskets thus fixed will effectually do the enemies' business, if they board the ship.

In a high sea, and fresh gale, there is no occasion for running your ship on shore, nor surrendering to the enemy, though ever so superior; for the enemy may fire all the shot in the ship and not hit your vessel; and it may be laid down as a certain fact, that no man is so foolish as to board a ship in a heavy sea; and the captains of privateers to venture their slender sides against a hard sided merchantman; and perhaps an instance cannot be produced that the privateers are not the sufferers, when they have the temerity to board in such cases.

To make the Enemy enter his Men over your Quarter.

But if, after all, the enemy come up with you, and is resolved to board you, (which is usual upon the weather side or quarter,) when the attempt be upon your bow, bear away before the wind, (which answers in a light ship,) bring your enemy astern, and oblige him to enter his men over your quarter; which, if he refuses, bring to the other way, and give him the other broadside. If he wears ship to make a second attempt, serve him so again, unless you have an advantage of laying him athwart hawse, which rarely offers to the leewardmost ship. Then, if the merchant ship be prepared with loop holes in the quarters, bulk heads, booby hatch, forecastle hatch, &c. if his men enter, they are exposed, upon their own forecastle, to the fire out of the loop holes in the quarters; and as they enter they are in no less danger from the fire through the bulk heads of the steerage, forecastle, &c.

But notwithstanding there is a great advantage in lying athwart the enemy's hawse, yet performing it is attended with a difficulty that ought to be considered before it is attempted; and it must be nicely performed, that, instead of being athwart the enemy's, he is not athwart your hawse. But this must be left to the discretion of the commanders.

Merchant vessels, in time of war, should have the cabin companion, steerage, booby and fore scuttle hatches, strongly built, and loop holes pierced through them and through the quarters. If the ship should have a round house, two pieces of cannon

ought to be fixed, with ports in the bulk head, to fire through in case of close quarters; and cannon through the sides of the cabin are very useful.

On a Merchantman being Boarded by a Privateer.

If a merchant ship cannot prevent a privateer from boarding her; before she is boarded, the commander must order all his guns in the waist and quarter deck to be discharged, without letting them run in, for if they should be loaded when the enemy enters, and they should point them aft, they could soon level the bulkheads with your own cannon: and if there should be cannon in the close quarters, those opposite to the side which the enemy are on should be discharged, got in, and the ports shut, to prevent the enemy from tossing in hand grenadoes or stink pots, to destroy or suffocate the men in the close quarters; and that they should be discharged is necessary, or otherwise a hand grenado or fire pot may be discharged in your close quarters, and do more damage to your ship than the enemy, and perhaps carry away a port, and make a vacancy where the enemy may toss in showers of hand grenadoes. Besides, in discharging your cannon they run in of themselves.

How to act when a Ship comes up in your wake, and lays you on board upon the quarter.

The enemy, in his attempt to board you, comes either by your wake, upon your quarter, upon your broadside, or upon your bow. If the enemy come up in your wake, ply him briskly with your chase guns, loaded with grape and cross-bar; and as soon as he is within pistol shot, give him your guns, loaded with double-headed shot, and canister. The former may destroy his masts and rigging, and the latter destroy his men. Next let the guns upon your quarter be got ready, loaded with double-headed and canister; and as the enemy ranges upon your quarter, with his men ready to enter, they may be discharged among them. Let, likewise, your powder tubs be ready, and just as the enemy is going to sheer on board, set fire to the fuze, hoist it up to the yard arm, and let it run amain among his men, on his deck. If he still persist in his resolution, and board you, let all your ports be lashed in, for fear the enemy wedge them, which might be of ill consequence; keep firing blunderbusses out of the loop holes in the quarter among his men, as they stand thick, and ready to enter. As soon as he is on board, spring your powder chest on your quarter; for while they are mounting your quarter, they will be numerous: let your men in the

round-house, be ready with their small arms to give the enemy a volley as soon as they come upon your deck; and those in the forecastle must keep a watchful eye upon the poop, that they do no mischief there; likewise, they must pick off the enemy as they mount the main and mizen rigging. If the enemy come in numbers on your deck, discharge one of your cannon out of your round-house, with canister shot at them; if that will not clear the deck, let fly the other; and if a breach is forced before the guns are reloaded, toss out of your ports some hand grenadoes. If this does not drive the enemy away before the guns are reloaded, then spring a powder chest on the quarter-deck as the last remedy; for it is prudent in a commander to let them stand as long as possible; because they do not only strike a terror into the enemy, but are at all times ready; and as long as they are standing, the enemy will conclude you are in no great extremity. Have a good eye to your rigging, and be sure to aim at the leading men. If you observe the enemy's vessel be so far aft that the chase guns may be brought to bear, spare two or three hands to ply them with round shot: aim at the water line, and if they be good marksmen, ten to one but they will spoil their cruize. If all the while the commander show an example of bravery, and the men fire with discretion, they will soon make a ship of considerable force leave so hot a place as they must consequently find.

It is the best Conduct for Merchantmen to fight before the Wind.

If all these advantages be rightly considered by mariners, and they act according to their usual courage, the enemy must purchase his prize with the blood of his men; and perhaps he may go without her, especially if the captain of the merchant ship add skill to the courage of his men, and will not suffer the enemy to possess the advantages he expects, by his good sailing; which is to be prevented only by bearing away when the engagement commences, or before. It is best for merchantmen to fight privateers before the wind, for the following reasons:

In an engagement, the smoke is very offensive to the leewardmost vessel; not only by blinding the men, and hiding the enemy a considerable time from their sight, making them act with fear and confusion, and shoot at random, but it also stifles and suffocates them; and it cannot be otherwise with a merchantman that fights upon a wind, because, if he out-sail the enemy, there will be no battle; and it is absurd to think the enemy will fight to leeward, when he can get to windward; because the ship to leeward, fighting with her weather guns, has her water line exposed (more or less according as it blows above the surface

of the water, and may be shot between wind and water; and one shot there, may prove of worse consequence than a hundred upon the upper works; for should she tack or bear away, without perceiving it, she may sink before it is known; whereas, before the wind the danger is avoided. Again, by the wind, if your head sails are disabled, your ship will fly to, and if the enemy be within musket shot, you must lay at his mercy. This danger may be avoided by fighting before the wind, as ships will steer that way almost with any sail, and provision may be made to keep her so, whatever damage may happen to her sails or rigging. And if you fight before the wind, and the enemy keep in your wake, or upon your quarter, you may bring to either way and give him a broadside, and then bear up round, and give him the other broadside; and by the time your ship is round the other way, your other broadside may be ready. But if your ship sails nearly or equally as fast as the enemy, this conduct must not be pursued, because it hinders your ship's way, and consequently shortens the chase; wherefore, to prevent this, get all the guns you can out of the stern ports, and keep continually firing, if near, with cross-bar, among his rigging; but at a distance fire round shot. This will give your ship way, and it may also carry away the enemy's topmasts, or a yard; and a merchant ship's stern may be made to be grape and musket ball proof, and have at least four cannon, which, raking the enemy's ship, will be equal to her broadside, if the enemy be a-beam.

Though it is best for a merchantman to fight before the wind, it is in some places impracticable, or dangerous; as upon a lee-shore, a weather shore, in a channel, &c.

A merchant ship fighting before the wind has many advantages; for if the merchant ship be well prepared, steering sail booms rigged out, with good preventers, preventer braces, and good quarters, they have greatly the advantage, particularly of those low privateers, where their men are so much exposed. If the men of the merchant ship be secured by good quarters from the privateer's musketry, she may destroy numbers of the privateer's men, by her grape from the cannon; and if there be a high sea, the privateer being low, the water at such times rolls over her, and they will not be able to load the cannon without damaging the cartridge.

Captain Swaine, of the ship Molly, of Philadelphia, being armed, and having good quarters, in the year 1799, somewhere on the coast of Europe, fell in with a heavy French brig privateer. Captain Swaine engaged this privateer before the wind. They made several attempts to board her, but without success. The grape shot were poured into the privateer from the Molly,

without her receiving much damage; while the privateer was very much injured, a great part of her rigging and spars being shot away. Captain Swaine saved his ship by fighting before the wind. When she arrived in Philadelphia, I saw her, and some hundreds of grape shot and musket balls were still sticking in her waists and quarters.

On Steering in Chasing or being Chased.

Good steering is a very essential thing, either in giving chase or being chased; so that it behoves the commanders of armed ships, in time of war, to be particular in noticing which of his men are the best helmsmen.

The following signals may be used on board of merchant ships in time of war, with but few flags, by having them numbered. A flag, when hoisted, may be made to express any particular number thus: Suppose, in order to express your meaning, the number 56 is required: hoist a flag numbered 5 over the one numbered 6, and in the same way for any number, which will express what is required.

Guns, lights, rockets, blue lights, &c. may be used as signals at night.

On Signals.

All signals, to be effectual, must be simple, and composed in such a manner as to express the same signification at whatever mast head, or yard arm, they may be displayed from.

Significations.

The ships of the fleet are to be denoted by particular vanes, fixed at either of the mast heads. Each ship is also to have assigned to her a particular pennant, which, being hoisted alone, expresses a wish to communicate with that ship; but when hoisted with a signal, expresses that the signal particularly applies to her.

General Significations.

0 An acknowledgment that the signal is understood by the fleet.
1 Annulling.
2 Tack, headmost and weathermost first.
3 Veer, sternmost and leewardmost first.
4 Make sail.
5 Shorten sail.
6 Ships ahead, shorten sail.

7 Ships astern, make more sail.
8 Gather together.
9 Open to a greater distance.
10 Heave to on the starboard tack.
11 Heave to on the larboard tack.
12 Take in your studding sails, and prepare to haul the wind.
13 Haul the wind to starboard.
14 Haul the wind to port.
15 Ships to starboard, join the fleet.
16 Ships to port, join the fleet.
17 Continue as before, though the commodore does otherwise.
18 Prepare to hoist foreign colours, (I will shew the nation's jack I mean.)
19 Show no lights during the night, and keep in close order, as I shall carry no toplight.
20 A strange sail is suspected to be in the fleet, any ship discovering her, is to hoist her ensign and run towards her.
21 Disperse, and each ship do the best for herself.
22 Be particularly attentive, as I am going to make several signals which I intend to have executed in the night.
23 Observe my telegraph.
24 For all commanders, or a particular commander.
25 For an officer from every ship, or a particular ship.
26 Open your signal letter.

To prevent these signals being of service to the enemy, let each ship be furnished with a signal letter, expressing, that "hereafter the numbers annexed to the significations will be shifted." For instance, let the significations in future be numbered 1, 2, 3, &c. instead of 0, 1, 2, &c.

Hours after Dark.

27	At the hour of		6	before midnight.
28	ditto	-	7	
29	ditto	-	8	
30	ditto	-	9	
31	ditto	-	10	
32	ditto	-	11	
33	ditto	-	12	midnight.
34	ditto	-	1	after midnight.
35	ditto	-	2	
36	ditto	-	3	
37	ditto	-	4	
38	ditto	-	5	
39	ditto	-	6	

The purpose of these signals will be seen by the two following examples. Let it be presumed that the fleet should be chased during the day, and that it is the intention of the commodore to avoid the enemy by altering the course after dark. To make a signal during the night for this purpose would show his situation; therefore, before dark, let the commodore show the hour he intends to alter his course, and the course he means to steer. Or should the commodore imagine he has not sufficient run for the night, let him show the hour he intends to heave to, which will prevent considerable confusion, as each ship will be prepared for the circumstance, and upon the look-out to avoid those which have already hove to.

Points of the Compass.

40	North	48	East	56	South	64	West
41	N b E	49	E b S	57	S b W	65	W b N
42	NNE	50	ESE	58	SSW	66	WNW
43	NE b N	51	SE b E	59	SW b S	67	NW b W
44	NE	52	SE	60	SW	68	NW
45	NE b E	53	SE b S	61	SW b W	69	NW b N
46	ENE	54	SSE	62	WSW	70	NNW
47	E b N	55	S b E	63	W b S	71	N b W

These signals are to show the course to be steered; or the bearings of an object pointed out by signal.

Significations which may be expressed by Ships of the Fleet.

72 A strange sail.
73 Two strange sail.
74 Three strange sail.
75 A fleet.
76 Request the assistance of a surgeon; ship nearest, to send her surgeon.
77 Request the commodore to go ahead, to set up my rigging.
78 Request to speak the commodore.
79 We are over-pressed with sail.
80 We have sprung a leak.
81 A mutiny is on board us.
82 We see the land.
83 We have got soundings.
84 We require immediate assistance, &c. &c.

Significations addressed to particular Ships.

85 Come within hail.
86 I intend to send a boat on board you.

87 Send a boat.
88 Lead the fleet.
89 Take a particular ship in tow. (The tower and tow's pennants will be shown.)
90 Cast off the ship in tow.
91 Make sail upon particular bearings, (as will be shown by the bearings expressed) and look out for the land.
92 Make sail upon particular bearings, and sound.
93 Chase upon particular bearings.
94 Bring the stranger to the commodore.
95 Examine the stranger. If neutral, pass her.
96 Hoist the admiralty signal.
97 Return to the fleet.
98 Situate yourself between the distant ships and the fleet, to repeat signals.
99 Keep your station, &c. &c.

Question Significations.

100 Do you see the land?
101 Have you got soundings?
102 Do you gain upon the chase?
103 Is the chase a friend, enemy, or neutral?
104 Is she of force?
105 What was your longitude by the mean of your late observations, continued on, by the chronometer, to the preceding noon?
106 What was your longitude by the chronometer, at the preceding noon?
107 What was your latitude by meridian, or double altitude, at the preceding noon?
108 What is your variation?
109 What are your soundings?
110 How many strange sail do you count? &c. &c.

All these questions are to be answered as explained under the head, "*Answering Significations.*"

Answering Significations.

111 No.
112 Yes.
113 Friend.
114 Neutral.
115 Enemy.
116 Suspicious.
117 I cannot say.
118 Inability.
119 Your signal is not distinct, &c. &c.

N. B. Longitude, latitude, and variation, are to be answered by first hoisting the flags expressing the number of the degrees, which being understood, then hoist the flags expressing the number of minutes; and if the number of sail you count, or your soundings be required, answer by hoisting the flags expressing the number of sail, or the number of fathoms.—Whenever the flags are intended to express a number, hoist a short white pennant with them to prevent their being taken for a signification.

Significations respecting Anchoring, and such as will apply only when at Anchor.

120 Repair on board, every person belonging to the fleet.
121 Prepare to sail.
122 Unmoor.
123 Moor.
124 Lie at single anchor.
125 I shall get under way in the night. (The hour will be shown.)
126 Weigh, outermost and leewardmost ships first.
127 Prepare to anchor.
128 Anchor.
129 Cut, or slip, outermost and leewardmost first, &c. &c.

Regular Manoeuvring Significations.

130 Form the order of sailing.
131 Form the order of battle upon the starboard tack.
132 Form the order of battle upon the larboard tack.
133 Form the order of retreat.
134 Starboard line, heave to.
135 Centre line, heave to.
136 Larboard line, heave to.
137 Starboard line, make sail, and follow in successon.
138 Centre line, make sail, and follow in succession.
139 Larboard line, make sail, and follow in succession.
140 Tack altogether.
141 Tack in succession.
142 Tack, and continue in the order of sailing.
143 Rear ship, heave to; the rest form in the order of retreat.
144 Starboard ship, heave to; the rest form the order of battle, on the starboard tack.
145 Larboard ship, heave to; the rest form the order of battle, on the larboard tack.
146 Rear ship, heave to; the rest form again in the order of battle, upon the same tack.

147 Van ship, heave to; the rest form again in the order of battle upon the same tack, &c. &c.

N. B. These significations are adapted to the manœuvres explained in the chapter "*On manœuvreing a Fleet.*"

The commander of the fleet will fire a gun at the instant any of these manœuvres are to be executed.

Significations appertaining to Battle.

148 Keep the people to their quarters.
149 Exercise the great guns and small arms.
150 Van division, engage.
151 Centre division, engage.
152 Rear division, engage.
153 Engage generally.
154 Leave off engaging.
155 Assist a disabled ship, &c. &c.

Night Signals.

Night signals should be used as little as possible, since they are frequently misunderstood. Of necessity, they must be composed either of *sound* or *light*, or the two blended together. If several lights are shown together, that they may have the same appearance from every horizontal situation, it will be necessary to hoist them in a vertical position. In the following signals, this circumstance is attended to: the plan is, to express *numbers by different kinds of lights;* guns being fired merely to call the attention of the fleet, prior to making any signal.

To express numbers, let each light represent *one*, each rocket *five*, and each blue-light *ten*, as shown in the following table.

Numbers.	Lights.	Rockets.	Blue lights.	SIGNIFICATIONS.
1	1			A general acknowledgment that the signal made is understood.
2	2			Tack, headmost and weathermost first.
3	3			Veer, sternmost and leewardmost first.
4	4			Heave to upon the starboard tack.
5		1		Heave to upon the larboard tack.
6	1	1		Annul the preceding signal.
7	2	1		Make sail.
8	3	1		I am overpressed with sail.
9	4	1		Shorten sail.

Numbers.	Lights.	Rockets.	Blue lights.	SIGNIFICATIONS.
10			1	To show my situation.
11	1		1	Headmost ships shorten sail.
12	2		1	Request to speak the commodore.
13	3		1	The fleet continue their course, though the commodore does otherwise.
			1	
14	4		1	I am in distress.
15		1	1	On discovering danger.
16	1	1	1	A stranger is suspected to be in the fleet.
17	2	1	1	Haul two points to starboard.
18	3	1	1	Haul two points to port.
19	4	1	1	North.
20			2	N. E.
21	1		2	East.
22	2		2	S. E.
23	3		2	South.
24	4		2	S. W.
25		1	2	West.
26	1	1	2	N. W. &c. &c.

Instructions and Remarks.

While the commodore is laying to, it will be proper for him to carry a light at the bowsprit end ; also, upon any ship's thwarting, to save a man or other circumstance, let her show one light forward and two aft, that other ships may see her situation, and know the position of her head.

Upon the signal being made to tack or veer, let every ship, as she gets upon the other tack, carry a light for a short time at each cathead, to show that she is about.

In dark, disagreeable weather, the commodore should frequently make the signal "*To show his situation,*" and should avoid manœuvreing during the night as much as possible.

Whenever a signal is made by the commodore, the top light should be covered, to prevent a confusion of lights.

All signal lanthorns should be made of glass, and be big enough to hold several candles, for the sake of a brilliant light.

To discover whether a ship is of the fleet or not, show *three* horizontal lights to her, and let the answer be *two* horizontal lights ; or, let a *sign* and *countersign* be agreed upon—as, hail the suspected vessel with the words, ... and let the answer be, ...

Fog Signals.

Fog signals can only be composed of *sound*, at different intervals, as shewn in the following table of significations.

Significations.

1 gun, at intervals—to shew my situation.
2 guns, quick—stand upon the starboard tack.
3 guns, quick—stand upon the larboard tack.
2 guns, a minute separate—lay to on the starboard tack.
3 guns, a minute separate—lay to on the larboard tack.
2 guns, 2 minutes separate—make sail.
3 guns, 2 minutes separate—shorten sail.
4 guns, quick—require assistance.
5 guns, quick—discovering danger.

Instructions.

All ships upon their proper tack and course to beat drums and ring bells at intervals.

All ships, either upon the wrong tack or off their course, or laying to, are to fire muskets continually till they renew their course.

A general acknowledgment that the signal made is understood is avoided, as guns from different ships of the fleet would cause confusion.

ON

PRACTICAL SEA GUNNERY.

The duty of the Gunner, Armourer, and Gunsmith on board a Ship of War.

THE gunner is to apply to the storekeeper of the ordnance, and receive from him by indenture, the ordnance, ammunition, small arms, and other stores allowed for the voyage; and if any part thereof be not good, he is to represent the same to the captain.

He is to see that the powder rooms be well secured, and in good order, before the powder is brought on board.

The powder, in copper hooped barrels, must be lodged in the ground tier; he must see that the doors of the powder rooms be well locked, the scuttles well shut and covered, and the keys delivered to the captain.

He is timely to advise the captain when any powder comes on board. He is not to remove the powder, fuzees, &c. without the captain's directions; so that fire and candles may be extinguished, sentinels posted, and all care used to prevent accidents.

He is not to go or send any person into the powder rooms, without leave of the captain; and to take care that they have nothing about them that will strike fire in clashing or falling.

No more than three rounds of parchment cartridges are to be filled at a time.

He is not to load the guns with unfit mixtures, which may endanger their splitting.

He is not to start the hand grenadoes, but return what is left at the end of the voyage.

In cutting up cordage, he is to observe the prescribed regulations. When the ship wants new supplies, he is to draw out an account, with an inventory of what remains: present the same to the captain, which being by him vouched, must be sent to the board of ordnance.

He must make out a half-yearly account, according to the method prescribed.

He is to keep good order in the gun room, and suffer none to lie there but those who have a right, or whom the captain shall direct, and cause a careful man of his crew to watch them every night.

He is to be frugal of his match, to burn no more than is allowed, and that over a tub of water.

After an engagement, he is to procure a survey to be made of the powder in general.

He is to keep an inventory of all the arms and utensils sent out of the ship, and get the same signed by the officer appointed to command the detachment, and witnessed by the captain's clerk.

When the ship comes into port to be refitted, &c. he is to get her cleared of the guns, and other ordnance stores as soon as possible.

He is to take care that the stores are safely returned, and he and the armourer are to attend the storekeeper, and other officers belonging to the ordnance, when the stores so returned are surveyed on shore.

At the end of the voyage he is to deliver his accounts into the office of ordnance.

The armourer and gunsmith are to assist the gunner, in the survey and receipt of the small arms, and to keep them clean, and in good order; but not to take them too often to pieces, which is detrimental. Their stations are in the gun room, where they are to observe the gunner's orders.

The gunner is to receive the armourer's tools from the office of ordnance, and is to account for them at the end of the voyage, in the same manner as for the other stores under his charge.

They are to return the small arms into the store, clean, and in good order, and must produce certificates, from the office of ordnance where the arms are returned, that they have discharged their duty well.

Parts of a Cannon defined.

1. The convex superficies of the metal, is all the outside of the piece.
2. The concave superficies is all inside.
3. The cascable, is the pummel or knob.
4. The base ring is the first thick cornish from the cascable, with an ogee annexed.
5. The touch-hole is the small hollow vent next the base ring, which serves to convey fire to the powder in the concavity of the piece.

6. The breech or coil, is all the metal behind the touch-hole.
7. The vent field, lies between the vent and vent astragal.
8. The vent astragal is the next cornish or ring to the vent.
9. The first reinforced ring, is that cornish next to the vent astragal; it hath an ogee annexed.
10. The first reinforced part of the piece, is that space between the base ring and the first reinforced ring.
11. The second reinforced part, is that space between the first and second reinforced rings.
12. The trunnions are two solid pieces, or knobs of metal, fixed to the convex superficies, by which the cannon hangs in the carriage.
13. The second reinforced, or trunnion ring, is the cornish next the trunnion, towards the little end of the piece.
14. The second reinforced astragal, sometimes called the cornish ring, is that cornish which is next, and pretty near the second reinforced ring.
15. The muzzle astragal is that cornish which encompasses the neck of the piece.
16. The fillets are the first ornaments of the muzzle, the muzzle ogee is the next, and adjacent to the muzzle ring.
17. The muzzle ring is the very extremity of the piece.
18. The chase bore, or concavity, is all the hollow or empty part of it; sometimes that is called the chase singly, which lies between the second reinforced and muzzle astragal.
19. The chamber, or charged cylinder, is that part of the chase which contains the powder, wad, and ball.
20. The vacant cylinder, is that part of the chase where the powder, wad, and ball lies not.
21. The line of the cylinder is an imaginary line, as it were the axis of the chase.
22. The dispart of the piece, is the nearest distance between the top of the fillet near the muzzle ring, and visual ray proceeding from the eye over the base ring, parallel to the line of the cylinder, or axis of the chase.

The Parts of a Carriage defined.

1. The cheeks, are too thick pieces of plank, that make the sides, upon which the carriage hangs by its trunnions, in semicircular beds.
2. Beds for the trunnions, are two semicircular holes cut in the cheeks or sides, towards the forepart or the head of the carriage.
3. Steps are the gradations of the cheeks from abaft.
4. The breast bed chuck or transom, is a strong thick piece of

plank at the head, let into the cheeks by grooves, it is fixed inclining, the lower edge upon the fore axis, and on the upper edge rests the body of the cannon.

5. Breast bolts run through the breast chuck and sides, and fasten all together; there is another called the fore bolt, which is in the head of the trunnion.
6. Two cap square bolts run through the sides nearly perpendicular, being ringed and fore-lock edat the bottom, serve to secure the cheeks from splitting.
7. The cap squares are broad circular pieces of iron, fastened to the upper ends of the cap square bolts, and serve to lock the trunnions into their beds.
8. The two slant bolts run quite through the cheeks rather inclining, and through the fore axis, they are ringed and forelocked at the bottom, and serve to fasten it to the carriage.
9. Two small forelocks with chains fixed to the cheeks, these are made to the eyes in the start bolts, to secure down the cap square.
10. Bed bolts runs through both cheeks, about the centre of the carriage, it serves to secure all together, and on it rests the fore ends of the stool bed.
11. The stool bed is a piece of plank, the upper end of which rests on the bed bolt, the other end having a chuck on the stool underneath affixed, rests upon the after axis; on this bed rests the breech of the cannon.
12. The coin is a piece of wood in the form of a wedge, it is used between the stool bed and the cannon, and serves to elevate the gun.
13. The axle trees are strong pieces of wood across the bottom of the carriage, on which the whole rests.
14. The trucks are a sort of wheels placed on the ends of the axle trees, for the purpose of drawing the gun with facility.
15. Linch pins are a kind of iron spikes that go through the axle trees, and serve to keep on the trucks, the end of each axle tree is iron hooped to prevent it from splitting.
16. The two axle tree bolts run inclining through each cheek, (about the second step) and through the after axis, (by being ringed and fore-locked) is fastened to the carriage, thence is another called the after bolt in the middle of the extreme face of the after axis.

    The upper plain of the after axle tree is broader than the fore one, that the chuck or stool of the bed may have more room to traverse.

17. The tail bolts run nearly perpendicular through the last

step and after axis, being also fore-locked and serve for further security; these are also for fixing the tackles.

18. The two ring bolts are posted one on each side, about the centre of the carriage; which the breechings pass through, there are two bolts more on each side, to fix the tackle to, the one near the after end, the other between that and the ring bolt, but a little higher, they are under the fourth step.
19. The breeching is a piece sized in the middle to the cascable, the two ends reeved through the two ring bolts, and fastened to the eye bolts in the side of the ship, these are to bring up the piece, when being discharged it runs in; they are likewise to keep the gun fast in bad weather.

The thickness of the cheeks are always supposed to be the same thickness as the diameter of the gun's bore to which it belongs.

To find whether Cannon be Taper Bored.

Take the diameter of the base ring, and also at the muzzle ring: half the difference is the dispart.

Then put the priming wire down the touch hole, until it rests upon the metal in the bottom of the chase; there make a mark on the priming wire level with the base ring; then apply the same priming wire to the chase at the bore, and mark it even with the muzzle ring. If the difference between these two marks is equal to the dispart, the piece is not taper bored. But if the distance between these two marks on the priming wire be less than the dispart, it is then taper bored; and twice their difference is the difference between the diameter of the chase at the touch-hole and muzzle. Now, suppose the difference is two inches, and the gun false bored, the chase inclines two inches towards the horizon; and if the gun be not taper bored, by this experiment it will be found so, and if it be taper bored, each two inches make four inches.

Or thus:—Prepare a bag of canvas, about four feet long, both ends made to draw close, like a purse; one end being drawn and tied, let the bag be filled with clay, or any other flexible substance; then close and fasten the other end; put the bag into the chase, and ram it home with the rammer, which has a hole in it, through which draw the line which is fastened to the upper end of the canvas; let it remain there three hours or longer, till you think the substance is hard enough to preserve the form it has received; then draw it out, and you will have the diameter of the chase in the breech, and the form of the charge cylinder, by which the cartridge may be made.

To find Flaws and Cracks in a Piece of Ordnance,

Take a large piece of spunk or touch-wood, set it on fire in several places: when half burned, put it into the chase, and stop both muzzle and touch-hole. If the piece be without cracks, the spunk will be extinguished, for want of air; otherwise it will burn out and perhaps you will see the smoke.

To find if a Piece of Ordnance be Honeycombed.

Take a looking-glass, and reflect the sun's rays into the chase, which will illuminate, and render the pores in the concave superficies visible; but if the sun does not shine, put a candle on the end of a pikestaff, and thrust it into the chase, and that will show the pores.

These defects may be attended with bad consequences, either by splitting the ordnance, or retaining some part of the cartridge unextinguished, which, if known, may be prevented by stopping the touch-hole, and sponging till extinguished.

To find how much Powder is sufficient for any Piece of Ordnance, either true or taper bored.

A gun, to have its just allowance of powder, and be free from danger of splitting, and the shot capable of the greatest execution. To do this is one of the greatest mysteries in gunnery; first, from the uncertainty of the quantity of the metal, and, secondly, from the strength of the powder. Various rules are prescribed; some of which are as follows, viz.

For every hundred weight of iron metal allow three ounces of powder, and for brass four. But it must be observed that guns may have the same weight of metal, the same bore, yet be of different lengths; consequently of different fortifications; or guns may have the same weight, length, and the diameters of their chases equal, and yet not be capacitated for the same quantity of powder, as is evident; as one may be true and the other false bored. Therefore this rule should never be put in practice but when the thinnest part of the metal at the touch hole is equal in thickness to the diameter of the chase. If the gun should not be true bored, it will follow that the metal on one side of the chase will be thicker than the other, and the gun, by this means, be rendered weak. The general rule on board merchant vessels, for long pieces, is to allow one third of the weight of the shot for one charge: for a six pounder, two pounds of powder; and for short pieces, such as carronades, one twelfth part of the weight of the shot. For a carronade carrying a twelve pound shot, allow one pound of powder, and so on in proportion to the weight of the shot.

Great care must be taken that pistol or musket powder be not used instead of cannon; for if it is, and in the same quantity, the piece is in danger of splitting, the difference of their strength is so great; and if the quantity be reduced, to equalize the strength of a charge of gunpowder, it will take up less room; it possesses less metal than cannon powder. On board ships of war, in the first five or six successive firings, the gun grows hot, so that more of the powder burns; so that they reduce the cartridge from one half the weight of the shot to that of one third.

How to know the Thickness of the Metal at the Touch Hole, at the Trunnions and Muzzle.

With a pair of calibers take the diameter of the piece at either of these parts, from which subtract the diameter of the bore: the half of the remainder will be the thickness of the metal at every place so measured.

Double fortified pieces have fully one diameter of the bore in the thickness of metal at the touch-hole, eleven sixteenths at the trunnions, seven eighths at the muzzle. These are not now in general use.

Hand Grenades.

A grenade is a hollow iron ball, filled with corn powder, with a fuze to fire the contents, and thereby break the shell when it arrives at the designed object. To make a fuze, take an equal quantity of powder and charcoal, and a third quantity of either of these quantities of saltpetre, beat them and sift them through a fine sieve; with this composition fill the spiggot, and drive it into the hole in the shell for that purpose.

You may try the composition, and make it burn as long as you please, by proportioning the charcoal.

How to fix Powder Chests.

Nail two boards together, like the roof of a house; put under it a cartridge of powder, and close up both ends; then make a cover, like a sea chest without a bottom, of convenient size to put over it; fill the vacancy with pebble stones, nails, pieces of iron, &c.

Mr. Park is of opinion that this machine is not very disadvantageous to the enemy; for if two port sails will prevent all damage from a hand grenade, that flies with greater force than the pieces of a powder chest, it must have but little effect; to render which more efficacious, he proposes the following con-

trivance, viz. First, let a sort of hand grenade be made of clay, and hollow, after the manner of a grenade, some three, four, five, and six inches in diameter, with a small vent hole; while the clay is flexible, let flint stones be put in, and wrought up so that the sharp flints may stick out from the surface, and let them be burnt in a kiln until they are as hard and as durable as brick; let some be triangular and some square, and some round: Let these be filled with corn powder, and over the vent hole let a layer of beaten powder be put. Through the boards, next the powder, let a great number of small holes be bored; then lay these earth shells with their vent holes next the boards with the holes; then nail on the chest part, and all is finished. To fire it a hole must be bored through the deck, into which put a hollow pipe, filled with powder, with a piece of canvas tied over to cover the end; prick the canvas when you are going to spring it; then fire a pistol at it, charged only with powder, without wad. These are placed upon the poop, quarter deck, or forecastle, quarters, and bows, and are very serviceable for merchantmen when boarded by the enemy.

Powder Pots.

These are made of potter's clay, with ears to tie lighted matches at both ends; they are to be filled with fine dry powder, or they may be filled with a composition of fine powder mixed with brimstone, beat small, some assafœtida, some pieces of verdigris, and some camphor; these, thrown into the round house of a ship, or between decks, or let fall from the yard arms of the merchant vessel on the enemy's decks, where the men are in numbers and in the act of boarding your vessel, will be very offensive. These kind of pots by sailors are called stink pots.

How to Prepare Powder Tubs.

Take a tight cask about two feet long, and eighteen inches in diameter, that has good staves, and well hooped with wooden hoops, unhead it, and in the middle of it place a small keg, having two cross bars going through it, and the cask to keep the former firm in its place; fill the keg with good corn powder, and bored full of holes with canvas before them, that the flash may set fire to the earth shells, being prepared like those of the powder chests; from the keg to the superficies of the cask a pipe must be fixed, and filled with such composition as is prepared for the fuzes of the hand grenades, to convey fire to the powder. This may be made for the durance of three minutes or less. From this let other pipes branch to the sides, to carry fire to the earth shells fixed to the canvas at the surface of the

cask; and so contrived that one of them may break every quarter of a minute or oftener. After this, head the cask up tight with a wooden mallet, that no water may penetrate it; set one upon each other, ready slung in the fore chains. and on the fore castle, when going to engage. If no opportunity present of firing them after the manner designed, yet they may be serviceable if the enemy should be on board and numerous, spring them as you do the powder chests, and in springing either, you must have from your close quarters a conveyance to carry fire to the abovementioned pipe.

To make Composition for the Fuzes of the Hand Grenade Shells.

Take one pound of gunpowder, four ounces of saltpetre, and one ounce of brimstone, beat them separately to powder. These ingredients, well mixed together, make a composition fit for use.

The Composition may be made thus:

First fill the shells with gunpowder; then make your fuzes with one pound of gunpowder, six ounces of saltpetre, and one ounce of charcoal.

Or, if you would have them of less duration, make them of the composition as above. The length of time you wish a fuze to burn, can be found by experiments before put in use.

How to fill Cartridges.

One pound of powder will fill 31 cubic inches and $\frac{6}{100}$ of a cubic inch; and this being allowed, to find what will fill a cartridge of any proportion:

Then say, as 31.06 cubic inches is to one pound of powder, so is any other number of cubic inches to the number of pounds of powder that will fill those inches. This will do either for shells or cartridges.

Before giving the mode of finding the cubic contents of a cartridge, a table of roots will be laid down from 1 to 9, and of the second and third power.

Cube Root.

Any number multiplied by its square, produces a cube; and when a cube is given to find that equal number of which it is composed, is called the extraction of the cube root; as if the root of 64 was required, it will be found to be 4, because 4 multiplied by 4 produces 16, the square of the second power, and 16 multiplied by 4 produces the cube of the third power.

A surd is an imperfect cube, whose root can never be exactly discovered.

The root of any single cube, is found by inspecting the following table, viz:

Single	1	2	3	4	5	6	7	8	9
	1	4	9	16	25	36	49	64	81
	1	8	27	64	125	216	343	512	729

A compound cube number must be prepared by fixing a point over your units place, and omitting two, point every third figure, and as many points as your number contains, so many figures will your root consist of.

Table of Weights and Diameters of Iron Shot in Common use.

The weight of shot is found in the left column, and in the right column the diameter of the ball in inches and hundred parts of an inch.

Weight—Pounds.	Diameter—Inches.
3	3.77
4	3.05
6	3.49
9	4.00
12	4.40
18	5.04
24	5.55
32	6.11
36	6.35
42	6.38
48	6.99

One pound of powder will fill 31.06 cubic inches; and this being allowed, to find what quantity will fill a shell or cartridge. This is the proportion, viz: as 31.06 cubic inches is to one pound of powder, so is any other number of cubic inches, to the number of pounds of powder that will fill those inches, whether it be shell or cartridge.

To know how much powder will fill a shell, whose concave axis is 9¼ inches or 9.25, being the concavity of a 13¾ inch shell, adapted to a 14 inch mortar.

To find the solid content in cubic inches, as a sphere or globe.

EXAMPLE.

```
              9.25
              9.25
              ----
              4625
             1850
            8325
            ------
            85.5625 the square of its axis.
               9.25
          ---------
          4278125
         1711250
        7700625
        ---------
As 21 is to 11, so is 791.453125=Cubic inches.
       791.453125
       ----------
   21)8705.984.375(414. 570. solidity in inches.
       84
       --
        30
        21
        --
         95
         84
         --
         119
         105
         ---
          148
          147
          ---
           14
           --
31.06)414.570(13.34 lbs. of powder to fill a shell.
      3106
      -----
      10397
       9318
       -----
       10790
        9318
        -----
        14720
        12424
        -----
         2296
```

To know how much powder will fill a cartridge whose diameter is 4 inches, and length 7½ or 7.50, one fifth of the cubic contents must be taken off from the round; which will be to the cubic contents as 5 is to 4.

EXAMPLE.

```
           7.50
              4
          -----
          30.00
              4
         ------
         120.00
         ------
    3106)96 00 one fifth off. (3
         -----
         93.18
         -----
          2.82
```

Three lbs. and about one ounce or rather more to fill the cartridge.

By some it is allowed that a pound of powder will fill 32 cubic inches: therefore, if you divide the given solidity in inches by 32, it will be as follows:

```
                  414.570
                  -------   lbs.
You may call   32)414.06(12. 939 nearly 13 lbs. of pow-
                     32              der to fill the shell.
                    ---
                     94
                     64
                    ---
                     300
                     288
                     ---
                      126
                       96
                      ---
                       300
                       288
                       ---
                        12
                        --
And in the second case, 32)96 00(3
                           96
                           -----
                           00 00
```

Three pounds of powder will fill a cartridge 7½ inches in length, and four inches in breadth.

The velocity of a cannon-ball, and its horizontal range, depends on the strength and quantity of powder.

By experiment, it has been found, that with the greatest allotment of powder, which is two thirds of the weight of the shot, (which is the quantity for land service) a 24 pound iron bullet, which is generally in use for land service, fired from a piece of customary size, has a velocity of 1650 feet in a second of time, and the distance a little less than three miles.

A 24 pound shot will carry further than a 32; but a 32 pound ball will do more execution.

If a musket barrel, of common length, fired with half the weight of the bullet in powder, and if the same barrel be shortened one half, and fired with the same charge, the velocity of the bullet will be about one sixth less.

A thirteen inch mortar, with 30 pounds of powder, its length about one half its diameter, and elevated to 45°, is found to throw a shell of $12\frac{3}{4}$ inches diameter, 3350 yards, equal to two miles, nearly; the shell weighing 231 pounds, the perpendicular height in its flight will be about 1000 yards.

The curve described by balls is not a parabola, nor near it, and the angle which gives the greatest amplitude, is not 45°, as is commonly supposed, but something less.

To batter a breach, two shot from a 24 pounder will do more execution than one from a 48 pounder: but at sea, a large gun is best; for if a large shot strike a vessel under water, the hole will not be so easily stopped, and by its great force, makes more splinters, and does more mischief.

It has been tried by experiment, the following pieces being fired at random shot, that

A	24	pounder	charged	with	16 lbs.	of powder,	carried	$2\frac{1}{2}$	miles.
An	18	do	do	do	12 do	do	do	$2\frac{1}{2}$	do
A	12	do	do	do	8 do	do	do	$2\frac{1}{10}$	do
A	9	do	do	do	6 do	do	do	2	do
A	6	do	do	do	4 do	do	do	$1\frac{9}{10}$	do
A	4	do	do	do	$2\frac{3}{4}$ do	do	do	$1\frac{3}{4}$	do

A table of the angle that the piece ought to be elevated above the line of its direction, in order to hit the object near the part aimed at; for different distances.

Distance. *Yards*	Elevation of piece.		
500	0°	13′	46″
750	0	20	16
1000	1	27	32
1500	1	41	18
1760	2	47	53

A gunner's quadrant should have a spirit level, fixed to the index, so that the elevation or depression might be readily obtained by moving the index till the bubble show its level: also, a piece may be elevated to any degree, by setting the index to the given elevation, and then by bringing the piece into position by the level.

REMARK.

When any object is to be bombarded on a horizontal plane, engineers generally elevate the piece to 45°, and then increase or diminish the charge of powder till the object aimed at be hit; and by this method of proceeding much powder is saved, for at 45° degrees of elevation, the velocity is less, and consequently requires a less charge, than at any other elevation; if the piece be elevated less than 45°, and the bomb does not fall at the distance required, the piece must be raised a little, but if the bomb falls beyond the object aimed at, it must be lowered, and by these trials the proper elevation may be acquired.

When any buildings are to be bombarded, then elevate the piece above 45°, for the bomb will then rise to a greater height, and consequently its fall will be with greater force, and therefore it will do more damage. But when the bomb is to be thrown amongst men, let the elevation be less than 45°, for then the bomb will not enter so far into the ground, and therefore the splinters, occasioned by its explosion, will do more execution.

The greatest distance to which a bomb of 5 or 6 hundred weight can be thrown with the strongest charge, is between 2 and 3 miles.

An iron bullet of 24 lb. weight, which is the heaviest in common use for land service, such a bullet fired from a piece of the customary size, with its greatest allotment of powder, ($\frac{2}{3}$ of its weight, *viz.* 16 lb.) has a velocity of 1650 feet in one second of time; and its horizontal range, by experiment, is something less than 3 miles; generally about $2\frac{3}{4}$.

The ball descends through a curve which is shorter and less inclined to the horizon than that in which it ascended; also the highest point of its flight, or vertex of the curve is much nearer to the place where it falls on the ground, than to that from whence it was projected: and the curve described is nearer the hyperbolic than the parabolic curve, but in a non-resisting medium the curve would be a parabola, which cannot be in the medium of the air in which all projections are made.

DEFINITIONS.

1. Angle of elevation or depression, according as it is above or below the horizontal line or level of the piece, is the angle which the line of direction makes with the horizon.

2. The amplitude or random, is the distance between the place of projection and the object aimed at.

3. The impetus is the greatest height that any cannon ball can ascend, when projected perpendicularly to the horizon; and is always just one half of the greatest random upon a horizontal plane.

4. The greatest random must be found by trials.

5. When the distance of the object on a horizontal plane is less than the greatest random of the piece, it may be then hit by two elevations, each whereof is the complement of the other to 90°.

6. When a ball is projected oblique to the horizon, it will in its motion describe a curve line, called a parabola, unless so far as the resistance of the air hinders it. As by the remark.

7. The greatest random on an inclined plane, and consequently the least force that can reach an object, is when the axis of the piece makes equal angles with the zenith and the object; and the projections are equal at elevations equally distant above and below this line of bisection; and this is true whether the projections be made on planes above or below the level of the piece.

8. The general rule for hitting any object, is to get your distance from it (by the method of altimetry and longimetry) as near as you can; then the impetus of the piece being known, it will be, as twice the impetus, is to radius, so is the distance of the object from you, to the sine of double the angle of elevation, whose half is the elevation required.

9. When the object is elevated above the plane of the horizon, then 45° added to $\frac{1}{2}$ the $<$ of elevation of the plane, gives the elevation of the piece; but when the object is depressed, then from 45° subtract $\frac{1}{2}$ the $<$ of the depression, and you will have the elevation of the piece, for the greatest random.

10. Mortars are generally elevated for their greatest randoms, for the throwing of bombs, &c. And when upon planes that are horizontal, then $\frac{1}{4}$ of the square root of the distance in feet, gives the number of seconds in the time of flight: The knowledge of which is of use for adjusting the fuze.

Every body, after the impressed force whereby it is put in motion ceases to act, continues to move uniformly in a right line; unless it be interrupted by some other force or obstacle.

By the action of gravity, the direction is changed, and the velocity is interrupted.

The motion or velocity acquired by a ball in freely descending from rest, by the force of an uniform gravity, is as the time of descent; and the space fallen through, as the square of that time.

Exercise of Great Guns.

The guns are to be loaded with powder and shot. The water tubs in their places, the matches lighted, the crows and handspikes, sponges, rammers, and rope sponges and rammers placed at the gun, in proper order, and the men at their quarters.

WORDS OF COMMAND.

1. Take heed.
2. Silence.
3. Cast off the tackles and breechings.
4. Seize the breechings.
5. Take out the tampion.
6. Take off the apron.
7. Unstop the touch-hole.
8. Handle the priming wire.
9. Prick the cartridge.
10. Handle the powder-horn.
11. Prime.
12. Bruise the priming.
13. Secure the powder-horn.
14. Take hold of the apron.
15. Cover the vent.
16. Handle your crows and handspikes.
17. Point the gun to the object.
18. Lay down your crows and handspikes.
19. Take off the apron.
20. Take your match, and blow it.
21. Fire.

You must take care that the guns do not touch the side of the port when you fire.

22. Stop the touch-hole.
23. Handle the sponge staff.
24. Sponge the gun.

In sponging the gun, the sponge is to be drawn backwards and forwards two or three times, as well as pushed home

strongly, and in taking it out, turn it round two or three times in the gun. Observe to strike your sponge well on the muzzle of the gun, to cleanse it. If you make use of a rope sponge, observe the shift ends, and have your rammer-head at hand.

25 Handle the cartridge.
26. Put it into the gun.

You must put the cartridge in as far as you can reach with your arm, the lower end first, and seam of the cartridge downwards.

27. Wad to your cartridge.
28. Handle the rammer.
29. Ram home, wad and cartridge.

Observe to give two or three strokes, to ram it well home.

30. Unstop the touch-hole.
31. Handle the priming wire.
32. Try if the cartridge be home.
33. Draw the rammer.
34. Shot the gun.
35. Wad.
36. Ram home, wad and shot.
37. Draw the rammer.
38. Stop the touch-hole.
39. Lay on the apron.
40. Run out the gun.

If you exercise the lee guns, and it blows fresh, you must keep one tackle hooked to the ring-bolt on the deck, near the comings, and the other tackle hooked to the ring, in the train of the carriage; but if you exercise the windward guns, keep both tackles hooked to the ship's side, and the train of the cartridge.

Exercise of the Small Arms.

The seamen who are to perform the exercise of the small arms, are to be drawn out in one rank, with their firelocks upon their left shoulder, and accoutred with swords, bayonets, and cartouches; and two paper granadoes, or wads in pouches, and match hanging at the girdle on the contrary side.

The lieutenant at arms is to stand opposite to the middle of the rank, with a firelock rested on his left arm: the master at arms to stand near him, with a firelock in his hand; and the two corporals to stand opposite to each end of the rank, with firelocks in their hands.

Words of Command.

1. Take care.
2. Join your right hand to your firelock.
3. Poise your firelock.
4. Join your left hand to your firelock.
5. Cock your firelock.
6. Present.
7. Fire.
8. Recover your arms.
9. Half cock your firelock.
10. Handle your cartridge.
11. Prime.
12. Shut your pans.
13. Cast about to charge.
14. Charge with cartridge.
15. Draw your rammers.
16. Shorten your rammers.
17. Put them in the barrels.
18. Ram down your charge.
19. Recover your rammers.
20. Shorten your rammers.
21. Return your rammers.
22. Cast off your firelocks.
23. Your right hands under your locks.
24. Poise your firelocks.
25. Shoulder your firelocks.

Exercise of the Bayonet.

26. Poise your firelocks.
27. Rest on your arms.
28. Draw your bayonets.
29. Fix your bayonets.
30. Rest your bayonets.
31. Charge your bayonets breast high.
32. Push your bayonets.
33. Recover your arms.
34. Rest on your arms.
35. Unfix your bayonets.
36. Return your bayonets.
37. Poise your firelocks.
38. Shoulder your firelocks.

To recover Gunpowder from damp.

If gunpowder should be damp, it may be dried by spreading it on deck on a sail ; but if it should get quite wet, it may be recovered, (if it be not too wet) by pounding it in a wooden mortar with a pestle of the same substance, and a small quantity of spirituous liquor added, from time to time, to moisten it. When the whole of the moisture is evaporated, so that the powder will not soil an earthen plate, it must be granulated, by passing it through a sieve, which is perforated to answer the granulation of the size you wish : and afterwards roll it in a barrel, and it will take a round form. Care must be taken that there be no nails in the barrel, and all fires put out on board. If powder be wet with salt water, after drying it in the sun it will become damp again after a while, when put below.

FAMILIAR SUBJECTS

ON

ASTRONOMY.

ASTRONOMY is that branch of natural philosophy which treats of the heavenly bodies. The determination of their magnitudes, distances, and the orbits which they describe, is called plane astronomy; and the investigation of the causes of their motions is called physical astronomy. The former discoveries are made from observations on their apparent magnitude and motions and the latter from analogy.

Of all the sciences cultivated by mankind, astronomy is acknowledged to be, and undoubtedly is, the most sublime, the most interesting, and the most useful; for, by knowledge derived from this science, not only the bulk of the earth is discovered, the situation and extent of the countries and kingdoms upon it ascertained, trade and commerce carried on to the remotest parts of the world, and the various products of several countries distributed for the health, comfort, and conveniency of its inhabitants; but our very faculties are enlarged with the grandeur of the ideas it conveys, our minds exalted above the low contracted prejudices of the vulgar, and our understandings clearly convinced, and affected with the conviction of the existence, wisdom, power, and goodness of the Supreme Being.

By astronomy we discover that the earth is at so great a distance from the sun, that if seen from thence it would appear no bigger than a point; although its circumference is known to be 25,020 miles: yet that distance is so small compared with the earth's distance from the fixed stars, that if the orbit in which the earth moves round the sun were solid, and seen from the nearest star, it would likewise appear no bigger than a point, although it is at least 162 millions of miles in diameter; for the earth in going round the sun is 162 millions of miles nearer to some of the stars at one time of the year than at another; and

yet their apparent magnitudes, situations and distances, from one another still remain the same; and a telescope which magnifies above 200 times, does not sensibly magnify them: which proves them to be at least 400 thousand times farther from us than we are from the sun.

It is not to be imagined that all the stars are placed in one concave surface, so as to be equally distant from us; but that they are placed at immense distances from one another through unlimited space: so that there may be as great a distance between any two neighbouring stars, as between our sun and those which are nearest to him. Therefore an observer, who is nearest any fixed star, will look upon it alone as a real sun; and consider the rest as so many shining points, placed at equal distances from him in the firmament.

By the help of telescopes we discover thousands of stars which are invisible to the bare eye; and the better our glasses are, still the more become visible: so that we can set no limits either to their number or their distances. The celebrated Huygens carried his thoughts so far, as to believe it not impossible that there may be stars at such inconceivable distances, that their light has not yet reached the earth since its creation; although the velocity of light be a million of times greater than the velocity of a cannon bullet; and, as Mr. Addison very justly observes, this thought is far from being extravagant, when we consider that the universe is the work of infinite power, prompted by infinite goodness; having an infinite space to exert itself in; so that our imaginations can set no bounds to it.

The sun appears very bright and large in comparison of the fixed stars, because we keep constantly near the sun, in comparison of our immense distance from the stars. For, a spectator placed as near to any star as we are to the sun, would see that star a body as large and bright as the sun appears to us: and a spectator, as far distant from the sun as we are from the stars, would see the sun as small as we see a star, divested of all its circumvolving planets: and would reckon it one of the stars in numbering them.

The stars being at such immense distances from the sun, cannot possibly receive from him so strong a light as they seem to have; nor any brightness sufficient to make them visible to us. For the sun's rays must be so scattered and dissipated before they reach such remote objects, that they can never be transmitted back to our eyes, so as to render these objects visible by reflection. The stars therefore shine with their own native and unborrowed lustre, as the sun does; and since each particular star, as well as the sun, is confined to a particular portion of space, it is plain that the stars are of the same nature with the sun.

Instead then of one sun and one world only in the universe, science discovers to us such an inconceivable number of suns, systems and worlds, dispersed through boundless space, that if our sun, with all the planets, moons, and comets, belonging to it, were annihilated, they would be no more missed, by an eye that could take in the whole creation, than a grain of sand from the sea-shore; the space they possess being comparatively so small, that it would scarce be a sensible blank in the universe, although Saturn, the outermost of our planets, revolves about the sun in an orbit of 4,884 millions of miles in circumference, and some of our comets make excursions upwards of ten thousand millions of miles beyond Saturn's orbit; and yet, at that amazing distance, they are incomparably nearer to the sun than to any of the stars; as is evident from their keeping clear of the attractive power of all the stars, and returning periodically by virtue of the sun's attraction.

From what we know of our own system, it may be reasonably concluded that all the rest are with equal wisdom contrived, situated, and provided with accommodations for rational inhabitants. Let us therefore take a survey of the system to which we belong; the only one accessible to us; and from thence we shall be the better enabled to judge of the nature and end of the other systems of the universe. For although there is almost an infinite variety in the parts of the creation, which we have opportunities of examining, yet there is a general analogy running through and connecting all the parts into one scheme, one design, one whole!

And then, to an attentive observer, it will appear highly probable, that the planets of our system, together with their attendants called satellites or moons, are much of the same nature with our earth, and destined for the like purposes; for they are solid opaque globes, capable of supporting animals and vegetables. Some of them are bigger, some less, and some much about the size of our earth. They all circulate round the sun, as the earth does, in a shorter or longer time, according to their respective distances from him; and have, where it would not be inconvenient, regular returns of summer and winter, spring and autumn. They have warmer and colder climates, as the various productions of our earth require: and, in such as afford a possibility of discovering it, we observe a regular motion round their axes like that of our earth, causing an alternate return of day and night; which is necessary for labour, rest, and vegetation, and that all parts of their surfaces may be exposed to the rays of the sun.

Such of the planets as are farthest from the sun, and therefore enjoy least of his light, have that deficiency made up by several moons, which constantly accompany and revolve about

them, as our moon revolves about the earth. The remotest planet has, over and above, a broad ring encompassing it; which like a lucid zone in the heavens reflects the sun's light very copiously on that planet: so that if the remoter planets have the sun's light fainter by day than we, they have an addition made to it morning and evening by one or more of their moons, and a greater quantity of light in the night time.

On the surface of the moon, because it is nearer to us than any other of the celestial bodies are, we discover a nearer resemblance of our earth; for, by the assistance of telescopes, we observe the moon to be full of high mountains, large valleys, and deep cavities. These similarities leave us no room to doubt, but that all the planets and moons in the system are designed as commodious habitations for creatures endowed with capacities of knowing and adoring their beneficent Creator.

Since the fixed stars are prodigious spheres of fire, like our sun, and at inconceivable distances from one another, as well as from us, it is reasonable to conclude they are made for the same purposes that the sun is; each to bestow light, heat, and vegetation, on a certain number of inhabited planets, kept by gravitation within the sphere of its activity.—FERGUSON.

Of the Figure of the Earth, and its Magnitude.

The figure of the earth, as composed of land and water, is nearly spherical; the proof of this assertion will be the principal object of this chapter. The ancients held various opinions respecting the figure of the earth; some imagined it to be cylindrical, or in the form of a drum; but the general opinion was, that it was a vast extended plane, and that the horizon was the utmost limits of the earth, and the ocean the bounds of the horizon. These opinions were held in the infancy of astronomy; and, in the early ages of Christianity, some of the fathers went so far as to pronounce it heretical for any person to declare that there was such a thing as the antipodes. But, by the industry of succeeding ages, when astronomy and navigation were brought to a tolerable degree of perfection, and when it was observed that the moon was frequently eclipsed by the shadow of the earth, and that such shadow always appeared circular on the disc or face of the moon, in whatever position the shadow was projected, it necessarily followed that the earth, which cast the shadow, must be spherical; since nothing but a sphere, when turned in every position with respect to a luminous body, can cast a circular shadow; likewise all calculations of eclipses, and of the places of the planets, are made upon supposition that the earth is a sphere, and they all answer to the true times when accurately calculated. When an eclipse of the moon happens,

it is observed sooner by those who live eastward than by those who live westward; and, by frequent experience, astronomers have determined that, for every fifteen degrees difference of longitude, an eclipse begins so many hours sooner in the eastern-most place, or later in the westernmost. If the earth were a plane, eclipses would happen at the same time in all places, nor could one part of the world be deprived of the light of the sun while another part enjoyed the benefit of it. The voyages of the circumnavigators sufficiently prove that the earth is round from west to east. The first who attempted to circumnavigate the globe, was Magellan, a Portuguese, who sailed from Seville, in Spain, on the 10th of August, 1519; he did not live to return, but his ship arrived at St. Lucar, near Seville, on the 7th of September, 1522, without altering its direction, except to the north or south, as compelled by the winds, or intervening land. Since this period the circumnavigation of the globe has been performed at different times by Sir Francis Drake, Lord Anson, captain Cook, &c. The voyages of the circumnavigators have been frequently adduced by writers on geography and the globes to prove that the earth is a sphere: but when we reflect that all the circumnavigators sailed westward round the globe, (and not northward and southward round it) they might have performed the same voyages had the earth been in the form of a drum or cylinder: but the earth cannot be in the form of a cylinder, for if it were, then the difference of longitude between any two places would be equal to the meridional distance between the same places, as on a Mercator's chart, which is contrary to observation.—Again, if a ship sail in any part of the world and upon any course whatever, on her departure from the coast, all high towers or mountains gradually disappear, and persons on shore may see the masts of the ship after the hull is hid by the convexity of the water. (*See Figure I. Plate XX.*) If a vessel sail northward, in north latitude, the people on board may observe the polar star gradually to increase in altitude the farther they go: they may likewise observe new stars continually emerging above the horizon, which were before imperceptible; and at the same time, those stars which appear southward, will continue to diminish in altitude till they become invisible. The contrary phenomena will happen if the vessel sail southward: hence, the earth is spherical from north to south, and it has already been shown that it is spherical from east to west.

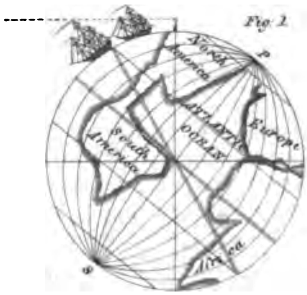
The arguments already adduced, clearly prove the rotundity of the earth, though common experience shows us that it is not strictly a geometrical sphere; for its surface is diversified with mountains and valleys: but these irregularities no more hinder the earth from being reckoned spherical, considering its mag-

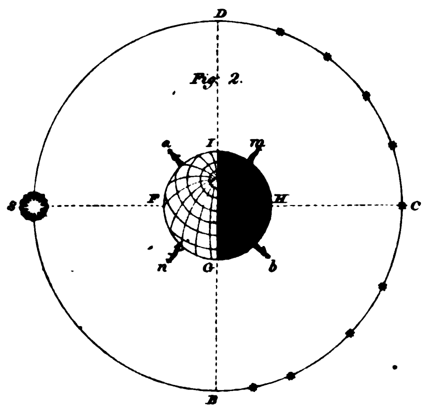
nitude, than the roughness of an orange hinders it from being esteemed round.

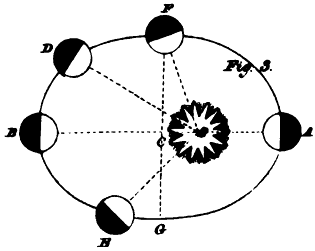
When philosophical and mathematical knowledge arrived at a still greater degree of perfection, there seemed to be very sufficient reason for the philosophers of the last age to consider the earth not truly spherical, but rather in the form of a spheroid. This notion first arose from observations on pendulum clocks, which being fitted to beat seconds in the latitude of Paris and London, were found to move slower as they approached the equator, and at, or near the equator they were obliged to be shortened about one eighth of an inch to agree with the times of the stars passing the meridian. This difference appearing to Huygens* and Sir Isaac Newton, to be a much greater quantity than could arise from the alteration by heat only, they separately discovered that the earth was flatted at the poles.—By the revolution of the earth on its axis (admitting it to be a sphere) the centrifugal force at the equator would be greater than the centrifugal force in the latitude of London or Paris, because a larger circle is described by the equator in the same time; but as the centrifugal force, (or tendency which a body has to recede from the centre) increases, the action of gravity necessarily diminishes; and where the action of gravity is less, the vibrations of pendulums of equal lengths become slower; hence supposing the earth to be a sphere, we have two causes why a pendulum should move slower at the equator than at London or Paris, viz: the action of heat, which dilates all metals, and the diminution of gravity. But these two causes combined would not, according to Sir Isaac Newton, produce so great a difference as one eighth of an inch in the length of a pendulum, he therefore supposed the earth to assume the same figure that a homogeneous fluid would acquire by revolving on an axis, viz: the figure of an oblate spheroid, and found that the "diameter of the earth at the equator, is to its diameter from pole to pole, as 230 to 229." Notwithstanding the deductions of Sir Isaac Newton, on the strictest mathematical principles, many of the philosophers in France, the principal of whom was Cassini, asserted that the earth was an oblong spheroid, the polar diameter being the longer; and as these different opinions were supposed to retard the general progress of science in France, the king resolved that the affair should be determined by actual admeasurement at his own expense. Accordingly, about the year 1735, two companies of the most able mathematicians of that nation were appointed: the one to measure the degree of a meridian as near to the equator as possible, and the other company to perform a like operation as near the pole as could be conve-

* A celebrated mathematician, born at the Hague, in Holland, in 1629.

Plate XX







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niently attempted. The results of these admeasurements contradicted the assertions of Cassini, and of J. Bernoulli, (a celebrated mathematician of Basil, in Switzerland, who warmly espoused his cause) and confirmed the calculations of Sir Isaac Newton. In the year 1756, the Royal Academy of Sciences at Paris appointed eight astronomers to measure the length of a degree between Paris and Amiens; the result of their admeasurement gave 57069 toises for the length of a degree.

The utility of finding the length of a degree in order to determine the magnitude and figure of the earth, may be rendered familiar to a learner thus: suppose I find the latitude of London to be 51½° north, and travel due north till I find the latitude of a place to be 52½° north, I shall then have travelled a degree, and the distance between the two places, accurately measured, will be the length of a degree: now, if the earth be a correct sphere, the length of a degree on a meridian, or a great circle, will be equal all over the world, after proper allowances are made for elevated ground, &c. the length of a degree multiplied by 360 will give the circumference of the earth, and hence its diameter, &c. will be easily found: but if the earth be any other figure than that of a sphere, the length of a degree on the same meridian will be different in different latitudes, and if the figure of the earth resemble an oblate spheroid, the lengths of a degree will increase as the latitudes increase. The English translation of Maupertuis' figure of the earth, concludes with these words: *The degree of the meridian which cuts the polar circle being longer than a degree of the meridian in France, the earth is a spheroid flatted towards the poles.* For, the longer a degree is, the greater must be the circle of which it is a part; and the greater a circle is, the less is its curvature.

The first person who measured the length of a degree with any appearance of accuracy was Mr. Richard Norwood; by measuring the distance between London and York, he found the length of a degree to be 367196 English feet, or 69½ English miles; hence, supposing the earth to be a sphere, its circumference will be 25020 miles, and its diameter 7964 miles;* but if the length of a degree, at a medium, be 57069 toises, the circumference of the earth will be 24873 English miles, its diameter 7917 miles, and the length of a degree 69$\frac{1}{10}$ miles.

Conclusion.—Notwithstanding all the admeasurements that have hitherto been made, it has never been demonstrated, in a satisfactory manner, that the earth is strictly a spheroid; indeed,

* 5280 feet make a mile, therefore 367196 divided by 5280 gives 69½ miles nearly, which, multiplied by 360, produces 25020 miles, the circumference of the earth, but the circumference of a circle is to its diameter as 22 to 7, or more nearly as 355 to 113; hence 355 : 113 : : 25020 miles : 7964 miles, the diameter of the earth.

from observations made in different parts of the earth, it appears that its figure is by no means that of a regular spheroid, nor that of any other known regular mathematical figure; and the only certain conclusion that can be drawn from the works of the several gentlemen employed to measure the earth is, that *the earth is something more flat at the poles than at the equator.* The course of a ship, considering the earth a spheroid, is so near to what it would be on a sphere, that the mariner may safely trust to the rules of globular sailing, even though his course and distance were much more certain than it is possible for them to be. For which, and similar reasons, mathematicians content themselves with considering the earth as a sphere in all practical sciences, and hence the artificial globes are made perfectly spherical, as the best representation of the figure of the earth.

Of the Diurnal Motion of the Earth.

The motion of the earth was denied in the early ages of the world: yet, as soon as astronomical knowledge began to be more attended to, its motion received the assent of the learned, and of such as dared to think differently from the multitude, or were not apprehensive of ecclesiastical censure.—The astronomers of the last and present age have produced such a variety of strong and forcible arguments in favour of the motion of the earth, as must effectually gain the assent of every impartial inquirer. Among the many reasons for the motion of the earth, it will be sufficient to point out the following.

The earth is a globe of 7964 miles in diameter; and by revolving on its axis every 24 hours* from west to east, it causes an apparent diurnal motion of all the heavenly bodies from east to west. We need only look at the sun, or stars, to be convinced that either the earth, which is no more than a point when compared with the heavens, revolves on its axis in a certain time, or else the sun, stars, &c. revolve round the earth in nearly the same time. Let us suppose, for instance, that the sun revolves round the earth in 24 hours, and that the earth has no diurnal motion. Now, it is a known principle in the laws of motion, that if any body revolve round another as its centre, it is necessary that the central body be always in the plane in which the revolving body moves, whatever curve it describes; therefore, if the sun move round the earth in a day, its diurnal path must always describe a circle which will divide the earth into two equal hemispheres. But this never happens

* That is, the time from the sun's being on the meridian of any place, to the time of its returning to the same meridian the next day; but the earth forms a complete revolution on its axis in 23 hours, 56 minutes, 4 seconds.

except on two days of the year, viz. at the time of the equinoxes, when the sun rises exactly in the east, and sets exactly in the west; for, in our summer, the sun rises to the north of the east, and sets to the north of the west; and in the winter it rises to the south of the east, and sets to the south of the west; and, therefore, its diurnal path divides the globe into unequal parts; consequently, the sun does not move round the earth. To render this more intelligible, let a pin, of some inches in length, be fixed perpendicular upon an horizontal plane, and observe the shadow that the top of it describes on any day of the year; this shadow will always be a curve, except at the time of the equinoxes; hence, the earth is never in the sun's apparent diurnal orbit but then: for, if the top of the pin kept all the time in the plane of the sun's apparent diurnal orbit, the shadow described would be a straight line; because, it would fall in the intersection of two planes; therefore, the sun has no diurnal motion round the earth, consequently, the earth has a diurnal motion on its axis.

It is no argument against the earth's diurnal motion that we do not feel it; a person in the cabin of a ship, on smooth water, cannot perceive the ship's motion when it turns gently and uniformly round: neither does the motion of the earth cause bodies to fall from its surface; for all bodies, of whatever matter they are composed, are drawn to the earth by the power of its central attraction; which, laying hold of them according to their densities, or quantities of matter, without regard to their magnitudes, constitutes what we call weight.

The phenomena of the apparent diurnal motion of the sun may be explained by the motion of the earth; thus, let I F G H (Plate XX. fig. II.) represent the earth, S the sun, and the circle D S B C the apparent concavity of the heavens. Let the earth revolve on its axis from I towards G (viz. from west to east.) Suppose a spectator to be at I, the sun, which is at an immense distance, and enlightens half the globe at once, will appear to be rising. As the earth moves round, the spectator is carried towards F, and the sun seems to increase in height: when he has arrived at F, the sun is at the highest. As the earth continues to turn round, the spectator is carried from F towards G, and the altitude of the sun keeps continually diminishing; when he has arrived at G, the sun is setting. During the time the spectator has been carried from I to G, the sun has appeared to move the contrary way. Hence, it is evident, that while the spectator is carried through the illuminated half of the earth, it is day-light; at the middle point F, it is noon; also, while he is carried through the dark hemisphere, it is night; and at H it is midnight. Thus, the vicissitude of day and night evidently appears by the rotation of the earth

about its axis: what has been said of the sun is equally applicable to the moon, or any star placed at S; therefore, all the celestial bodies seem to rise and set by turns, according to their various situations. The spectator at I, F, G, H, will always have his feet towards the centre of the earth, and the sky above his head, whatever position the earth may have; agreeably to the laws of gravitation or attraction. Thus an inhabitant at *a* will be the most powerfully attracted towards his antipodes *b*, because, there is the greatest mass of earth under his feet in that direction; for the same reason *b* will be the most attracted towards *a*, *m* towards *n*, and *n* towards *m*, &c. Hence, it appears, that every body on the surface of the earth is attracted towards its centre, or rather towards the antipodes of that body, for the whole earth is the attracting mass, and not some unknown substance placed in the centre of the earth. There is no such thing as an upper and under side of the earth. Suppose *a* to be an inhabitant of Nankin in China, *b* will be an inhabitant of South America, near Buenos Ayres, each having the earth under his feet, and the sky above his head; also, if *n* be an inhabitant a little east of Quito in South America, on the equator, *m* will be an inhabitant upon the equator in the island of Sumatra, and in the course of 12 hours, *n* will have the very same position as *m*, by the revolution of the earth.

Of the Annual Motion of the Earth.

The diurnal revolution of the earth on its axis being proved, the annual motion round the sun will be readily admitted; for, either the earth moves round the sun in a year, or else the sun moves round the earth: now, by the laws of centripetal force, if two bodies revolve about each other, they revolve round their common centre of gravity;* and it is evident, that if the two bodies be of equal magnitude and density, the centre of gravity will be equidistant from each body; but, if they be of different magnitudes, the centre of gravity will be nearest to the larger body; if the earth, therefore, remain in the same situation while the sun revolves round it, its magnitude must be vastly greater than that of the sun; for it is contrary to the laws of nature for a heavy body to revolve round a light one as its centre of motion: but, from observations on the dimensions and distances of the sun and planets, it appears that the sun so greatly exceeds, not only the earth, but the planets, in magnitude, that the common centre of gravity of the whole is almost constantly within the body of the sun, so that the sun's motion round the common centre of gravity of the earth and

* The centre of gravity of two bodies is a point, on which, if they were both supported by a line joining their centres, they would rest in equilibrium.

the planets is not perceptible by ordinary observers. Not only the earth, therefore, but the planets, move round the sun.

The earth is computed to be 95 millions of miles from the sun, and performs its revolution round him, describing an elliptical orbit or path, in 365 days, 5 hours, 48 minutes, and 48 seconds, from any equinox or solstice to the same again; it travels at the rate of upwards of 68,000 miles per hour. Besides this motion, which is common to every inhabitant on the earth, the inhabitants at the equator are carried 1042 miles every hour by the diurnal revolution of the earth on its axis, while those in the parallel of London are carried only about 644 miles per hour. The axis of the earth makes an angle of 23° 28′, with a perpendicular to the plane of its orbit, and keeps always the same oblique direction throughout its annual course; hence, it follows that, during one part of its course, the north pole is turned towards the sun, and, during another part of its course, the south pole is turned towards it in the same proportion; which is the cause of the different seasons, as spring, summer, autumn, and winter. The orbit of the earth being elliptical, the earth must at some times approach nearer to the sun than at others, and will, of course, take more time moving through one part of its path than through another. Astronomers have observed, that the earth is more rapid in our winter half of its orbit than in the summer, by about seven days; but, although in our winter we are nearer to the sun than in the summer, yet, in that season, it seems farthest from us, and the weather is more cold and inclement: the simple account of which phenomenon is, that the sun's rays falling more perpendicularly on us in summer, augment the heat of the weather; so, being transmitted more obliquely on our parallel of latitude during the winter, the cold is increased and rendered more intense. The heat in the torrid zone does not arise from those parts of the earth being nearer to the sun, but from the rays of the sun falling directly perpendicular upon, and darting immediately through the atmosphere. It might likewise be expected that, as we are less distant from the sun in the winter than in the summer, it would appear larger; but the difference of situation is so small as to make no sensible alteration in the sun's apparent magnitude.

The sun is not supposed to be fixed in the centre of the earth's elliptical orbit, but in one of the foci. Let S represent the sun (Plate XX. Fig. III.) and A G F B D E the elliptical orbit of the earth. Then A is called the perihelion, being the earth's nearest distance from the sun; B is called the aphelion, being the greatest distance of the earth from the sun, and S C the distance between the sun (in the focus) and the centre, is called the eccentricity of the earths orbit. If, from the centre C, there be erected upon the axis A B the perpendicular C E meeting

the orbit in E, and the line S E be drawn, it will represent the mean distance of the earth from the sun, being equal to half the axis A B, consequently S E is 95 millions of miles.

Though the motion of the earth in its orbit be not uniform, yet it is regulated by a certain immutable law, from which it never deviates; which is, that a line drawn from the centre of the sun to the centre of the earth, being carried about with an angular motion, describes an elliptical area proportional to the time in which that area is described, viz. if the times in which the earth moves from A to E, from E to D, and from D to B, be equal, then the areas, or spaces, A S E, E S D, and D S B, will all be equal. The motion of the earth is sometimes quicker and sometimes slower in moving through equal parts of its orbit; for, when the earth is at A (in the winter) the sun attracts it more strongly, and therefore the motion is quicker than any where else: likewise, when it is at B (in the summer) it is least affected by the sun's attraction, and, consequently, the motion there is slower than in any other part of its orbit, for the power of gravity decreases as the square of the distance increases; besides, it is obvious, from the construction of the figure, that, if the space A S E be described in the same time with the space B S D, the arch A E will be greater than the arch B D.

The phenomena of the different seasons of the year, will appear plainly from the following observations. Let A B C D (Plate XXI. Fig. 1.) represent the plane of the earth's annual orbit, having the sun in the focus F; and let *a b*, an imaginary line passing through the centre of the earth, be perpendicular to this plane; and let the axis N S, of the earth, make an angle of 23° 28′ with this perpendicular; then, if the earth move in the direction of A, B, C, D, in such a manner that N S may always remain parallel to itself, and preserve the same angle with *a b*, it will point out the seasons of the year; for, suppose a line to be drawn from the centre of the sun to the centre of the earth, it is evident that the sun will be vertical to that part of the earth which is cut by this line. Now, when the earth is in Libra ♎, the sun will appear to be in Aries ♈, the days and nights will be equal in both hemispheres, and the season a medium between summer and winter; the line dividing the dark and light hemispheres, passes through the two poles N and S, and, consequently, divides all the parallels of latitude, as P R, into two equal parts; hence the inhabitants of the whole face of the earth have their days and nights equal, viz. twelve hours each. While the earth moves from Libra ♎ to Capricorn ♑, the north pole N will become more and more enlightened, and the south pole S will be gradually involved in darkness; consequently, the days in the northern hemisphere will continue to

increase in length, and in the southern hemisphere they will decrease in the same proportion, all the parallels of latitude being unequally divided. When the earth has arrived at Capricorn ♑, the sun will appear to be in Cancer ♋, it will be summer to the inhabitants of the northern hemisphere, and winter to those in the southern; the inhabitants at the north pole, and within the arctic circle, will have constant day, and those at the south pole, and within the antarctic circle, will have constant night. While the earth moves from Capricorn ♑ to Aries ♈, the south pole will become more and more enlightened; consequently, the days in the southern hemisphere will increase in length, and in the northern hemisphere they will decrease. When the earth has arrived at Aries ♈, the sun will appear to be in Libra ♎, and the days and nights will again be equal all over the surface of the earth. Again, as the earth moves from Aries ♈ towards Cancer ♋, the light will gradually leave the north pole and proceed to the south; when the earth has arrived at Cancer ♋, it will be summer to the inhabitants of the southern hemisphere, and winter to those in the northern: the inhabitants of the south pole (if any) will have continual day, those at the north pole, constant night.—Lastly, while the earth moves from Cancer ♋ to Capricorn ♑, the sun will appear to move from Capricorn ♑ to Cancer ♋, and the days in the northern hemisphere will be increasing, while those in the southern will be diminishing in length; and while the earth moves from Capricorn ♑ to Cancer ♋, the sun will appear to move from Cancer ♋ to Capricorn ♑; the days in the northern hemisphere will then be decreasing, and those in the southern hemisphere increasing. In all situations of the earth, the equator will be divided into two equal parts; consequently, the days and nights at the equator are always equal. Thus, the different seasons are clearly accounted for, by the inclination of the axis of the earth to the plane of its orbit, combined with the parallel motion of that axis.

Of the Solar System. Plate XXI. Fig. II.

The solar system is so called because the sun is supposed to be placed in a certain point, termed the centre of the system, having all the planets revolving round him at different distances, and in different periods of time. This is likewise called the Copernican system.

OF THE SUN.

The sun is situated near the centre of the orbits of all the planets, and revolves on its axis in 25 days 14 hours 8 minutes.

This revolution is determined from the motion* of the spots on its surface, which first make their appearance on the eastern extremity, and then, by degrees, come forwards towards the middle, and so pass on till they reach the western edge, and then disappear. When they have been absent for nearly the same period of time which they were visible, they appear again as at first, finishing their entire circuit in 27 days 12 hours 20 minutes.

The sun is likewise agitated by a small motion round the centre of gravity of the solar system, occasioned by the various attractions of the surrounding planets; but, as this centre of gravity is generally within the body of the sun, and can never be at the distance of more than the length of the solar diameter from the centre of that body, astronomers generally consider the sun as the centre of the system, round which all the planets revolve; though in reality the centre of gravity of the sun and of all the planets is the centre of the world. As the sun revolves on an axis, his figure is supposed not to be strictly in the form of a globe, but a little flatted at the poles; and that his axis makes an angle of about eight degrees, with a perpendicular to the plane of the earth's orbit. As the sun's apparent diameter is longer in December than in June, it follows that the sun is nearer to the earth in our winter than it is in summer; for the apparent magnitude of a distant body diminishes as the distance increases. The mean apparent diameter of the sun is stated to be 32′ 2″; hence, taking the distance of the sun from the earth to be 95 millions of miles as before determined, its real diameter will be 886149 miles; and, as the magnitudes of all spherical bodies are as the cubes of their diameters, the magnitude of the sun will be 1377613 times that of the earth; the diameter of the earth being only 7964 miles, the diameter of the sun is above one hundred and eleven times the diameter of the earth.

OF MERCURY ☿.

Mercury is the least of all the planets whose magnitudes are accurately known, and the nearest to the sun. The inclination of its axis to the plane of its orbit, and the time it takes to revolve on its axis, are unknown, consequently the vicissitudes of

* When we look at the sun with a telescope of moderate magnifying power, furnished with a piece of black glass, to intercept a portion of the solar rays, we occasionally perceive a number of dark spots upon its surface, of various forms and magnitudes. Though these spots have sometimes been sufficiently large to be distinguished by the naked eye, yet they were not discovered till after the invention of the telescope.—FERGUSON.

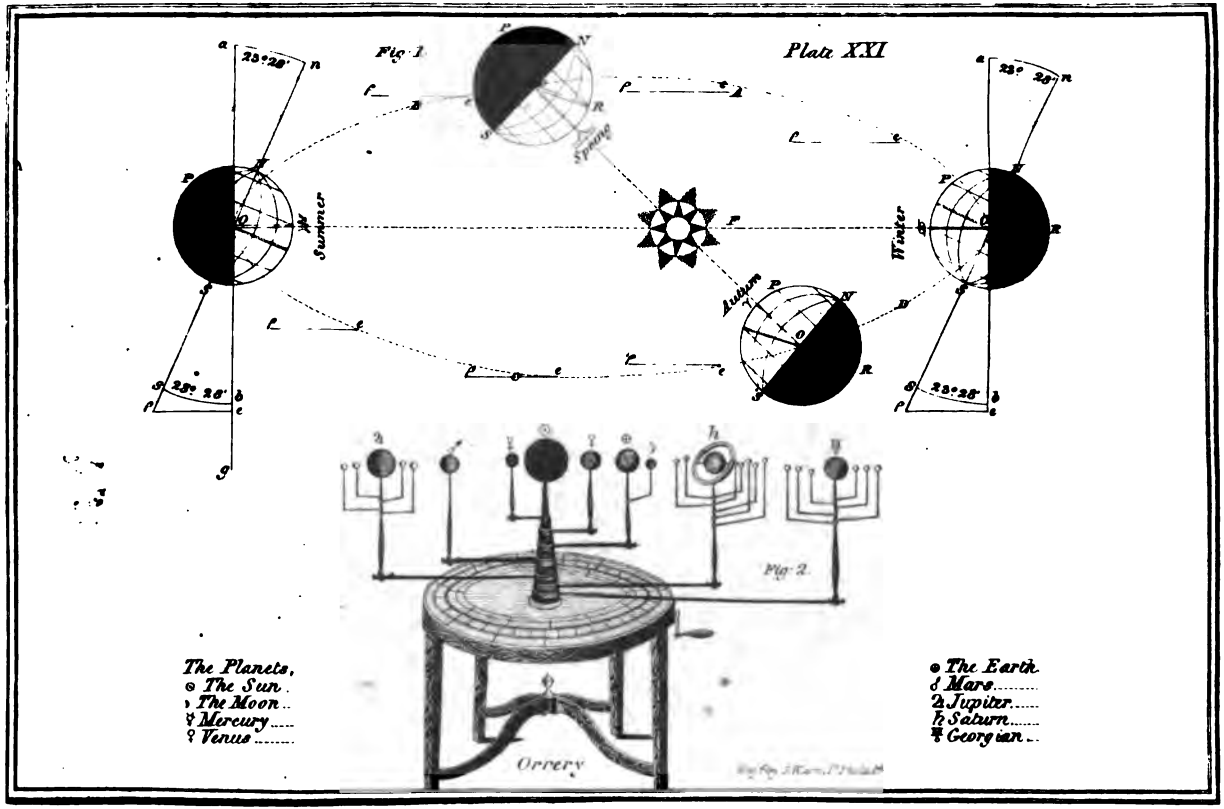


Plate XXI
Fig. 1.
Summer
Spring
Autum
Winter
23° 28'
Fig. 2.
Orrery
The Planets,
☉ The Sun
☽ The Moon
☿ Mercury
♀ Venus
⊕ The Earth
♂ Mars
♃ Jupiter
♄ Saturn
♅ Georgian

its seasons, and the length of its day and night, are likewise unknown. Mercury is seen through a telescope sometimes in the form of a half moon, and sometimes a little more or less than half his disc is seen; hence, it is inferred, that he has the same phases as the moon; except that he never appears quite round, because his enlightened side is never turned directly towards us, unless when he is so near the sun as to become invisible, by reason of the splendour of the sun's rays. The enlightened side of this planet being always towards the sun, and his never appearing round, are evident proofs that he shines not by his own light; for, if he did, he would constantly appear round. The best observations of this planet are those made when he is seen on the sun's disc, called his transit; for, in his lower conjunction, he sometimes passes before the sun, like a little spot, eclipsing a small part of the sun's body, only observable with a telescope. That node from which Mercury ascends northward above the ecliptic is the fifteenth degree of Taurus; and, consequently, the opposite or descending node is the fifteenth degree of Scorpio. The earth is in the fifteenth degree of Taurus on the sixth of May, and in the fifteenth of Scorpio on the 4th of November; and when Mercury comes to either of his nodes at his inferior conjunction (viz: when he is between the earth and the sun,) he will pass over the sun's disc, if it happen on or near the days above mentioned: but in all other parts of his orbit, he goes either above or below the sun, and consequently his conjunctions are invisible.

Mercury performs his periodical revolution round the sun in 87 d. 23 h. 15 min. 43 sec.; his greatest elongation is 28° 20′, distance from the sun 36814721 miles; the eccentricity of his orbit is estimated at one fifth of his mean distance from the sun; his apparent diameter 11″; hence, his real diameter is 3108 miles, and his magnitude about one sixteenth of the magnitude of the earth.

Mercury emits a bright white light; he appears a little after sunset, and again a little before sun rise; but, on account of his nearness to the sun, and the smallness of his magnitude, he is seldom seen. The light and heat which this planet receives from the sun, are about seven times greater than the light and heat which the earth receives. The orbit of Mercury makes an angle of seven degrees with the ecliptic, and he revolves round the sun at the rate of upwards of one hundred and nine thousand miles per hour. The manner in which the earth revolves round the sun, has already been explained, and, as all the other planets move in a similar manner in elliptical orbits, having the sun in one of the foci, what has been observed respecting the earth will be equally applicable to all the planets.

OF VENUS ♀.

Venus is the brightest, and, to appearance, the largest of all the planets. Her light is distinguished from that of the other planets by its brilliancy and whiteness, which are so considerable that, in a dusky place, she causes an object to cast a sensible shadow. Venus, when viewed through a telescope, appears to have all the phases of the moon, from the crescent to the enlightened hemisphere, though she is seldom seen perfectly round. Her illuminated part is constantly turned towards the sun; hence, the convex part of her crescent is turned towards the east when she is a morning star, and towards the west when she is an evening star; for, when Venus is west of the sun, as seen from the earth, that is, when her longitude is less than the sun's longitude, she rises before him in the morning, and is then called a morning star; but when she is east of the sun, viz: when her longitude is greater than the sun's longitude, she shines in the evening after the sun sets, and is then called an evening star.

Venus is a morning star, or appears west of the sun for about 290 days, when she is an evening star, or appears east of the sun for nearly the same length of time, though she performs her whole revolution round the sun in 224 days, 16 hours, 49 minutes, 10 seconds. A very natural question may here be asked, viz: Why Venus appears a longer time to the eastward or westward of the sun than the whole time of her entire revolution round him? This is easily answered, by considering that, while Venus is going round the sun, the earth is going round him the same way, though slower than Venus, and therefore the relative motion of Venus is slower than her absolute motion.

Sometimes Venus is seen on the disc of the sun in the form of a dark round spot. These appearances happen but seldom, viz: they can happen only when Venus is between the earth and the sun, and when the earth is nearly in a line with one of the nodes of Venus. The last transit of Venus was in 1769, and there will not happen another of them till the year 1874. The time which this planet takes to revolve on its axis, and the inclination of its axis to the plane of its orbit, have been given by different astronomers; but Dr. Herschel, from a long series of observations on this planet, published in the Philosophical Transactions for 1793, concludes, that the time of this planet's rotation on its axis is uncertain, and that the position of its axis is equally uncertain; that its atmosphere is very considerable; that it has probably inequalities on its surface, but that it requires a better eye than his, or the assistance of better instruments than he is possessed of, to discover any mountains. The apparent diameter of Venus is stated to be 58.59″; the eccen-

tricity of her orbit 473100 miles; her greatest elongation 47° 48′; her revolution round the sun is performed in 224 d. 16 h. 49 min. 10 sec. as before stated; and, if her apparent diameter be taken as above, her true diameter will be 7498 miles, and her magnitude something less than that of the earth; likewise her distance from the sun which will be found to be 68791752 miles.

The light and heat which this planet receives from the sun, are about double to what the earth receives. The orbit of Venus makes an angle of 3° 23′ 35″ with the ecliptic, and she revolves round the sun at the rate of upwards of eighty thousand miles per hour. This planet, like Mercury, never departs from the sun; she is only visible a few hours in the morning before the sun rises, or in the evening after he sets, an evident proof that the orbits of these planets are contained within the orbit of the earth, otherwise they would be seen in opposition to the sun, or above the horizon at midnight.

OF MARS ♂.

Mars appears of a dusky red colour, and though he is sometimes apparently as large as Venus, he never shines with so brilliant a light. From the dulness and ruddy appearance of this planet, it is conjectured that he is encompassed with a thick cloudy atmosphere, through which the red rays of light penetrate more easily than the other rays. This being the first planet without the orbit of the earth, he exhibits to the spectator appearances different from Mercury and Venus. He is sometimes in conjunction with the sun, like Mercury and Venus, but was never known to transit the sun's disc. Sometimes he is directly opposite the sun, that is, he comes to the meridian at midnight, or rises when the sun sets, and sets when the sun rises; at this time he shines with the greatest lustre, being nearest to the earth. Mars, when viewed through a telescope, appears sometimes full and round, at others gibbous, but never horned. The foregoing appearances clearly show, that Mars moves in an orbit more distant from the sun than that of the earth. The apparent motion of this planet, like that of Mercury and Venus, is sometimes direct, or from east to west; at others retrograde, or from west to east; and sometimes he appears stationary. Sometimes he rises before the sun, and is seen in the morning; at others he sets after the sun, and of course is seen in the evening. Mars revolves on its axis in 24 hours 39 minutes 22 seconds; and its polar diameter is to its equatorial diameter as 15 to 16, according to Dr. Herschel; but Dr. Maskelyne, who carefully observed this planet, at the time of opposition, could perceive no difference between its axis. The inclination of the orbit of Mars to the plane of the ecliptic is 1° 51′; the place of his ascending node about 18°

in Taurus, his horizontal parallax is said to be 23″.6; he performs his revolution round the sun in 686 days 23 hours 15 minutes 44 seconds; and his apparent semidiameter, at his nearest distance from the earth, is 25″; consequently his mean distance from the sun is 144907630 miles; his diameter 4218 miles; and his magnitude a little more than one seventh of that of the earth. This planet travels round the sun at the rate of 55223 miles per hour; and the parallax of the earth's annual orbit, as seen from Mars, is about 41 degrees. As the distances of the interior planets from the sun are found by their elongations, so the distances of the exterior planets may be found by the parallax of the earth's annual orbit.

OF THE NEW PLANETS, CERES, PALLAS, JUNO, AND VESTA.

On the 1st of January, 1801, M. Piazzi, astronomer royal at Palermo, in the island of Sicily, discovered a new planet between the orbits of Mars and Jupiter, generally called Ceres Ferdinandia, from the island in which it was discovered, and Ferdinand IV. king of the Two Sicilies. The elements of the theory of this planet are at present very imperfectly known: it appears like a star of the eighth magnitude; consequently, it is invisible to the naked eye. Its distance from the sun is said to be about $2\frac{4}{5}$ times that of the earth, and its periodical revolution nearly four years and eight months. This planet, called by some astronomers an asteroid, is not confined within the ancient limits of the zodiac. Its diameter, according to Dr. Herschel, is about 162 miles.

On the 28th of March 1802, Dr. Olbers of Bremen, while examining some of the stars near the newly discovered planet, Ceres Fernandina, perceived a star of the seventh magnitude, situated near the northern wing of the constellation Virgo, which had the appearance of a planet. By continuing his observations, he soon discovered it to be a new planet, to which he gave the name of Pallas. As the theory of the various phenomena of this planet is less known even than that of Ceres Ferdinandia, the accounts of its magnitude, distance, and the time of its periodical revolution round the sun, must be very imperfect. Its distance from the sun, and the time of its revolution, are stated to be nearly the same as those of Ceres Fernandina, and its diameter about 95 miles.

III. On the first of September, 1804, Mr. Harding, of Lilienthal, in the duchy of Bremen, discovered the planet Juno. It appears like a star of the eighth magnitude. The planets or Asteroids, Ceres, Pallas, and Juno, are all so nearly at equal distances from the sun, that it is not yet decided with certainty, which of the three is the nearest, or the most remote.

IV. On the 29th of March, 1807, at 21 min. past 8, mean time, Dr. Olbers discovered a fourth new planet, called Vesta;

its right ascension, at that time was 184° 8′ and its declination 11° 47′ N. It is apparently about the same distance from the sun as the three already mentioned. In size it appears like a star of the fifth magnitude.

OF JUPITER ♃, AND HIS SATELLITES.

Jupiter is the largest of all the planets, and, notwithstanding his great distance from the sun and the earth, he appears to the naked eye almost as large as Venus, though his light is something less brilliant. Jupiter when in opposition to the sun (that is, when he comes to the meridian at midnight, or rises when the sun sets, and sets when the sun rises,) is much nearer to the earth than he is a little before and after his conjunction wirh the sun; hence, at the time of opposition, he appears larger and more luminous than at other times. When the longitude of Jupiter is less than that of the sun, he will be a morning star, and appear in the east before the sun rises; but, when his longitude is greater than the sun's longitude, he will be an evening star, and appear in the west after the sun sets. Jupiter revolves on his axis in 9 hours 56 minutes, which is the length of his day; but as his axis is nearly perpendicular to the plane of his orbit, he has no diversity of seasons. Jupiter is surrounded by faint substances, called zones or belts; which from their frequent change in number and situation, are generally supposed to consist of clouds. One or more dark spots frequently appear between the belts, and when a belt disappears, the contiguous spots disappear likewise. The time of the rotation of the different spots is variable, being less by six minutes near the equator than near the poles. Dr. Herschel has determined, that not only the times of rotation of the different spots vary, but that the time of rotation of the same spot (between the 25th of February, 1778, and the 12th of April) varied from 9 hours 55 minutes 20 seconds, to 9 hours 51 minutes 35 seconds.

The inclination of the orbit of Jupiter to the plane of the ecliptic is 1° 18′ 56″; the place of his ascending node about 8 degrees in Cancer; and he performs his revolution round the sun in 4330 days 14 h. 27 min. 11 sec. moving at the rate of 29894 miles per hour, his mean distance from the sun being 494499108 miles. Jupiter at his mean distance from the earth, at the time of opposition, subtends an angle of 46″; hence, his real diameter is 89069 miles; and his magnitude 1400 times that of the earth. The light and heat which Jupiter receives from the sun are about $\frac{1}{27}$ of the light and heat which the earth receives.

On account of the great magnitude of Jupiter, and his quick revolution on his axis, he is considerably more flatted at the

poles than the earth is. The ratio between his polar and equatorial diameters has been differently stated by different astronomers: Dr. Pound makes it as 12 to 13; Mr. Short as 13 to 14; Dr. Bradley as 12½ to 13½; and Sir Isaac Newton (by theory) as 9¼ to 10¼.

Of the Satellites of Jupiter.

Jupiter is attended by four satellites, or moons, each of which revolves round him in a manner similar to that of the moon round the earth. The times of their periodical revolutions round Jupiter, and their respective distances from his centre, are given in the following table:

Satellites.	Periodical Revolution	Distance from Jupiter in semi-diameters.	Distance from Jupiter in English miles.
	d. h. m. sec.		
I.	1 . 18 . 27 . 33	5.67	252511
II.	3 . 13 . 13 . 42	9.00	400810
III.	7 . 3 . 42 . 33	14.38	640406
IV.	16 . 16 . 32 . 18	25.30	1126723

The satellites of Jupiter are invisible to the naked eye: they were first discovered by Galileo, the inventor of telescopes, in the year 1610. This was an important discovery; for, as these satellites revolve round Jupiter in the same direction in which Jupiter revolves round the sun, they are frequently eclipsed by his shadow, and afford an excellent method of finding the true longitudes of places on the land. To these eclipses we likewise owe the discovery of the progressive motion of light; and hence the abberation of the fixed stars.

The satellites of Jupiter do not revolve round him in the same plane, neither are their nodes in the same place. These satellites appear of different magnitudes and brightness; the fourth generally appears the smallest, but sometimes the largest, and the apparent diameter of its shadow on Jupiter is sometimes greater than the satellite. M. Cassini and Mr. Pound supposed that the satellites of Jupiter revolved on their axes; and Dr. Herschel has discovered that they revolve about their axes in the time in which they respectively revolve about Jupiter.

The first satellite is the most important of the four, from its numerous eclipses. The time of the eclipses of the satellites of Jupiter are calculated for the meridian of Greenwich, and inserted in the third page of the Nautical Almanac for every month. As the earth turns on its axis from west to east at the

rate of 15 degrees in an hour, or one degree in four minutes of time, a person one degree westward of Greenwich will observe the emersion or immersion of any one of the satellites of Jupiter four minutes later than the time mentioned in the Nautical Almanac; and, if he be one degree eastward of Greenwich, the eclipse will happen four minutes sooner at his place of observation than at Greenwich. These eclipses must be observed with a good telescope and a pendulum clock which beats seconds or half seconds.

The configuration of the satellites of Jupiter at ten o'clock at night, in the year 1796, are given in the Nautical Almanac as in the following table:

1	.4 2 ● O 1. 3.
2	.4 .2 O 1. 3.
4	.4 O 3. 1. 2.
5	.4 1.O O 3. 2.
7	.3 O .1 .2 .4
12	.1 2 ó 4 3. O

EXPLANATION.

On the first day of the month, given above, the second satellite is eclipsed at ten at night; the first and fourth satellites are on the left hand of Jupiter, and the third satellite on the right hand. When a satellite has north latitude, that is, when it is above the orbit of Jupiter, it is marked with a point on the left hand, as .4; when the satellites have south latitude, or when they are below the orbit of Jupiter, they are marked with a point on the right hand, as 1. 3.

On the second day of the month at the same hour, the second and fourth satellites are on the left hand of Jupiter and in north latitude; and the first and third are on the right hand, in south latitude.

On the fifth day, the first satellite will appear like a bright spot on the disc of Jupiter; the second and third will be on the left hand, in south latitude; and the fourth on the right hand, in north latitude.

On the seventh day the four satellites will appear in a straight line, and all in north latitude; the first, second, and fourth, will be on the right hand of Jupiter, and the third on the left.

On the twelfth day, the second and fourth satellites will be in conjunction, or appear as one; the first will be in north latitude, and the third in south latitude. Only three of the satellites will be visible, and all of them on the left hand of Jupiter.

By observations on the satellites of Jupiter the progressive motion of light was discovered; for it has been found by repeated experiments, that, when the earth is exactly between Jupiter and the sun, the eclipses of Jupiter's satellites are seen 8¼ minutes sooner than the time predicted by calculating from astronomical tables, truly constructed; and when the earth is nearly in the opposite point of its orbit, these eclipses happen about 8¼ minutes later than the time predicted; hence it is inferred, that light take up about 16½ minutes of time to pass over a space equal to the diameter of the earth's annual orbit, which is 190 millions of miles, or double the distance of the earth from the sun; for if the effects of light were instantaneous, the eclipses of the satellites would, in all situations of the earth in its orbit, happen exactly at the time predicted by calculation.

OF SATURN ♄, HIS SATELLITES, AND RING.

Saturn shines with a pale feeble light, being the farthest from the sun of any of the planets that are visible without a telescope. This planet when viewed through a good telescope, always engages the attention of the young astronomer by the singularity of its appearance. It is surrounded by an interior and exterior ring, beyond which are seven satellites or moons, all, except one, in the same plane with the rings. These rings and satellites are all opaque and dense bodies, like that of Saturn, and shine only by the light which they receive from the sun. The disc of Saturn is likewise crossed by obscure zones or belts, like those of Jupiter, which vary in their figure according to the direction of the rings. Saturn performs his revolution round the sun in 10759 days 1 hour 51 minutes 11 seconds; hence his mean distance from the sun is 907089032 miles; and his progressive motion in his orbit is 22072 miles per hour.

The inclination of the orbit of Saturn to the plane of the ecliptic is said to be 2° 29′ 50″, and the place of his ascending node about 21 degrees in Cancer.

Saturn, at his mean distance from the earth, subtends an angle of 20″: hence his real diameter is 78730 miles, and his magnitude 966 times that of the earth. The light and heat which this planet receives from the sun is about one hundredth part of the light and heat which the earth receives.

According to Herschel, Saturn revolves on his axis from west to east in 10 hours 16 min. 2 sec. and this axis is perpendicular to the plane of his ring. The equatorial diameter of Saturn, viz. the diameter in the direction of the ring, is to the polar diameter, viz. the axis, as 11 to 10.

Of the Satellites of Saturn.

Saturn is attended by seven moons: the fourth was discovered by Huygens, a Dutch mathematician, in the year 1655. The first, second, third, and fifth, were discovered at different times, between the years 1671 and 1685, by Cassini, a celebrated Italian astronomer. The sixth and seventh satellites were discovered by Dr. Herschel in the years 1787 and 1789. The two satellites discovered by Dr. Herschel are nearer to Saturn than the other five, and therefore should be called the first and second; but to distinguish them from the other satellites, and to prevent confusion in referring to former observations, they are called the sixth and seventh satellites. The seventh satellite, which is nearest to Saturn, was discovered a short time after the sixth. In the following table, the satellites are arranged according to their respective distances from Saturn, and the Roman figures in the left hand column show the number of the satellite. The figures between the parentheses show the order in which they ought to be numbered.

Satellites.	Periodical revolution. d. h. min. sec.	Distance from Saturn in semi-diameters.		Distance from Saturn in English miles.
VII. (1)	0 . 22 . 37 . 3	$2\frac{4}{5}$	Dr. Hutton's Math. Dic.	111534
VI. (2)	1 . 8 . 53 . 9	$3\frac{5}{8}$		139964
I. (3)	1 . 1 . 18 . 7	$4\frac{3}{8}$		172222
II. (4)	2 . 17 . 44 . 51	$5\frac{1}{2}$		216507
III. (5)	4 . 12 . 25 . 11	8		314920
IV. (6)	15 . 22 . 41 . 16	18		708570
V. (7)	79 . 7 . 53 . 43	54		21257 0

The first, second, third, and fourth satellites, as well as the sixth and seventh, are all nearly in the same plane with Saturn's ring, and are inclined to the orbit of Saturn in an angle of about 30 degrees; but the orbit of the fifth satellite is said to make an angle of 15 degrees with the plane of Saturn's ring. Sir Isaac Newton conjectured that the fifth satellite of Saturn re-

volved round its axis in the same time that it revolved about Saturn; and the truth of his opinion has been verified by the observations of Dr. Herschel.

Of Saturn's Ring.

The ring of Saturn is a thin, broad, and opaque circular arch, surrounding the body of the planet without touching it. like the wooden horizon of an artificial globe. If the equator of the artificial globe be made to coincide with the horizon, and the globe be turned on its axis from west to east, its motion will represent that of Saturn on its axis, and the wooden horizon will represent the ring, especially if it be supposed a little more distant from the globe. The ring of Saturn was first discovered by Huygens; and when viewed through a good telescope, appears double. Dr. Herschel says, that Saturn is encompassed by two concentric rings, of the following dimensions.

	Miles.
Inner diameter of the smaller ring - - - -	146345
Outside diameter of ditto - - - - -	184393
Inner diameter of the larger ring - - - -	190248
Outside diameter of ditto - - - - -	204883
Breadth of the inner ring - - - - -	20000
Breadth of the outer ring - - - - -	7200
Breadth of the vacant space, or dark zone between the rings - - - - - - - - -	2839

The ring of Saturn revolves round the axis of Saturn, and in a plane coincident with the plane of his equator, in 10 hours 32 min. 15.4 sec. The ring being a circle, appears elliptical, from its oblique position; and it appears most open when Saturn's longitude is about 2 signs 17 degrees, or 8 signs 17 degrees. There have been various conjectures relative to the nature and properties of this ring.

OF THE GEORGIUM SIDUS, OR HERSCHEL ♅, AND ITS SATELLITES.

The Georgian is the remotest of all the known planets belonging to the solar system; it was discovered at Bath, hy Dr. Herschel on the 13th of March 1781. This planet is called by the English the Georgium Sidus, or Georgian, a name by which it is distinguished in the Nautical Almanac. It is frequently called by foreigners Herschel, in honour of the discoverer. The royal academy of Prussia, and some others, call it Ouranus, because the other planets are named from such heathen deities as were relatives: thus, Ouranus was the father of Saturn, Saturn the father of Jupiter, Jupiter the father of Mars,

&c. This planet, when viewed through a telescope of a small magnifying power, appears like a star of between the 6th and 7th magnitude. In a very fine clear night, in the absence of the moon, it may be perceived, by a good eye, without a telescope. Though the Georgium Sidus was not known to be a planet till the time of Dr. Herschel, yet astronomers generally believe that it has been seen long before his time, and considered as a fixed star.

In so recent a discovery of a planet at such an immense distance, the theory of its magnitude, motion, &c. must be in some degree imperfect. Its periodical revolution round the sun is said to be performed in 30445½ days, or upwards of 83 years; the ratio of its diameter to that of the earth, is as 4.32 to 1; consequently its magnitude is upwards of eighty times that of the earth. If the periodical revolution of the Georgian, as above, be truly ascertained, its distance from the sun may be determined by Kepler's rule, as for the other planets.

The Georgian planet is attended by six satellites; their periodical revolutions and times of discovery are as follow:

	d.	h.	m.	s.	
I. or nearest, revolves in	5	21	25	0,	discovered in 1798.
II. - -	8	17	1	19,	discovered in 1787.
III. - -	10	23	4	0,	discovered in 1798.
IV. - -	13	11	5	1½,	discovered in 1787.
V. - -	38	1	49	0,	discovered in 1798.
VI. - -	107	16	40	0,	discovered in 1798.

All these satellites were discovered by Dr. Herschel; their orbits are said to be nearly perpendicular to the ecliptic; and, what is more singular, they perform their revolutions round the Georgian planet in a retrograde order, viz. contrary to the order of the signs.

OF THE ELONGATIONS, &c. OF THE INTERIOR PLANETS.

Let T E *e* (Plate XXII Fig. 1.) represent the orbit of the earth; *a w v x f g h* the orbit of an interior planet, as Mercury or Venus, and S the sun.

Let T represent the earth, S the sun, and *a* Venus at the time of her inferior conjunction; at this time she will disappear, like the new moon, because her dark side will be turned towards the earth. While Venus moves from *a* towards *w* she appears to the westward of the sun, and becomes gradually more and more enlightened (having all the different phases of the moon.) When she arrives at *v*, her greatest elongation, she appears half enlightened, like the moon in her first quarter; at this time she shines very bright. From her inferior to her superior conjunction, viz. from her situation in that part of her orbit which is directly between the earth and the sun as at *a*,

to her situation in that part of her orbit in which the sun is between her and the earth, she rises before the sun in the morning, and is called a morning star. From her superior to her inferior conjunction she shines in the evening, after the sun sets, and is then called an evening star.

From the greatest elongation of Venus when westward of the sun, as at *v*, to her greatest elongation when eastward of the sun, as at *g*, she will appear to go forward in her orbit, and describe the arch V W H G amongst the fixed stars; but from *g* to *v* she will appear retrograde, or return to the point V in the heavens in the order G H W V. For when Venus is at *f*, she will be seen among the fixed stars at H, and when at *g*, she will appear at G: when she arrives at *h* she will again appear at H in the heavens. Hence, in a considerable part of her orbit between *f* and *h*, and between *w* and *x*, she will appear nearly in the same point among the fixed stars, and at these times is said to be stationary.

When a planet appears to move from the neighbourhood of any fixed stars, towards others which lie to the eastward, its motion is said to be direct; when it proceeds towards the stars which lie to the west, its motion is retrograde; and when it seems not to alter its position amongst the fixed stars, it is said to be stationary.

If the earth stood still at T, the planet Venus would seem to make equal vibrations from the sun each way, forming the equal angles *g* T S and *v* T S, each 47° 48′, her greatest elongation, and the stationary points would always be in the same place in the heavens; but it must be remembered that, while Venus is proceeding in her orbit from *a* towards *x*, the earth is going forward from T towards E; hence, the stationary points, and places of conjunction and opposition, vary in every revolution.

What has been observed with respect to Venus, may be applied with a little variation to Mercury.

OF THE STATIONARY AND RETROGRADE APPEARANCES OF THE EXTERIOR PLANETS.

Because the earth's orbit is contained within the orbit of Mars, Jupiter, &c. they are seen in all sides of the heavens, and are as often in opposition to the sun as in conjunction with him. Let the circle in which T is situated (Plate XXII. Fig. 1.) represent the orbit of the earth, and that in which M is situated the orbit of Mars. Now, if the earth be at T when Mars is at M, Mars and the sun will be in conjunction, but if the earth be at *t* when Mars is at M, they will be in opposition, viz. the sun will appear in the east when Mars is in the west. If the earth stood still at T, the motion of the planet Mars would always appear direct; but the motion of the earth being

Plate XXII

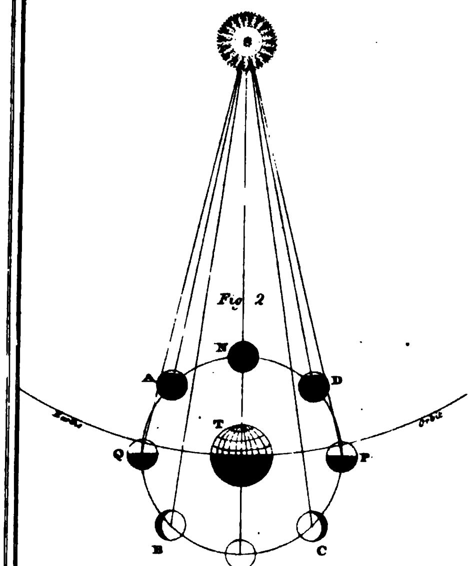


Fig. 2

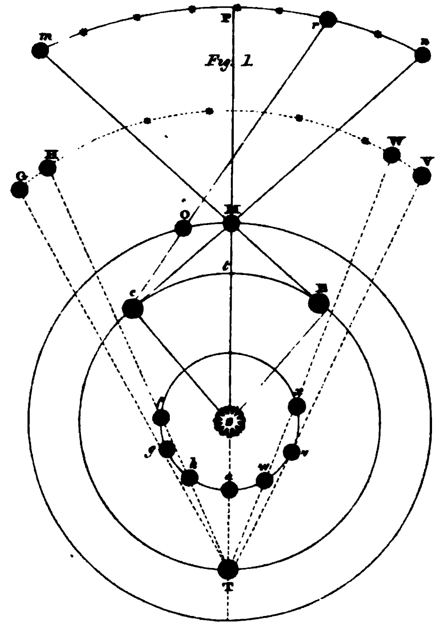


Fig. 1

Eng^d by J. Warr J^r Philad^a

more rapid than that of Mars, he will be overtaken and passed by the earth. Hence Mars will have two stationary and one retrograde appearance. Suppose the earth to be at E when Mars is at M, he will be seen in the heavens among the fixed stars at *m*; and for some time before the earth has arrived at E, and after it has passed E, he will appear nearly in the same point *m*, viz. he will be stationary. While the earth moves through the part E *t e* of its orbit, if Mars stood still at M, he would appear to move in a retrograde direction through the arch *m* P *r n*, in the heavens, and would again be stationary at *n*; but if during the time the earth moves from E to *e*, Mars moves from M to O, the arch of retrogradation would be nearly *m* P *r*.

The same manner of reasoning may be applied to Jupiter and all the superior planets.

The Motion of the Fixed Stars.

All the fixed stars, except the polar star, appear to have a diurnal motion from east to west: this arises from the diurnal motion of the earth on its axis from west to east. The fixed stars have also a small apparent motion about their real places, arising from the velocity of the earth in its orbit, combined with the motion of light. This motion is called the aberration of the fixed stars, and was discovered by Dr. Bradley. They vary in their situations by the precession of the equinoxes; hence, their longitudes, &c. vary considerably in a series of years, which renders it necessary to have new plates engraven for our celestial globes at least once in about fifty years.

Dr. Maskeline observes, that many, if not all the fixed stars, have small motions among themselves, which are called their proper motions; the cause and laws of which are hid, for the present, in almost equal obscurity.

Of the Magnitudes, Distance, Number, and Appearance of the Fixed Stars.

The magnitude of the fixed stars will probably forever remain unknown; all that we can have any reason to expect is a mere approximation founded on conjecture. From a comparison of the light afforded by a fixed star, and that of the sun, it has been concluded that the magnitudes of the stars do not differ materially from that of the sun. The different apparent magnitudes of the stars is supposed to arise from their different distances; for the young astronomer must not imagine that all the fixed stars are placed in a concave hemisphere, as they appear in the heavens, or on a convex surface, as they are represented on a celestial globe.

From a series of accurate observations by Dr. Bradley on γ Draconis, he inferred that its annual parallax did not amount

to a single second; that is, the diameter of the earth's annual orbit, which is not less than 190 millions of miles, would not form an angle at this star of one second in magnitude; or, that it appeared in the same point in the heavens during the earth's annual course round the sun.

The same author calculates the distance of γ Draconis from the earth to be 400,000 times that of the sun, or 38,000,000, 000,000 miles; and the distance of the nearest fixed star from the earth to be 40,000 times the diameter of the earth's orbit, or 7,600,000,000,000, miles. These distances are so immensely great, that it is impossible for the fixed stars to shine by the light of the sun reflected from their surfaces: they must, therefore, be of the same nature with the sun; and, like him, shine by their own light.

The number of the fixed stars is almost infinite, though the number which may be seen by the naked eye in the whole heavens does not exceed, and perhaps falls short of 3000, comprehending all the stars from the first to the sixth magnitude inclusive; but a good telescope, directed almost indifferently to any point in the heavens, discovers multitudes of stars invisible to the naked eye. That bright irregular zone, the milky way, has been very carefully examined by Dr. Herschel; who has, in the space of a quarter of an hour, seen 116000 stars pass through the field of view of a telescope of only 15′ aperture.

The fixed stars are the only marks by which astronomers are enabled to judge of the course of the moveable ones, because they do not vary their relative situations. Thus, in contemplating any number of fixed stars, which to our view form a triangle, a four sided figure, or any other, we shall find that they always retain the same relative situation, and that they have had the same situation for some thousands of years, viz. from the earliest records of authentic history. But as there are few general rules without some exceptions, so this general inference is likewise subject to restrictions. Several stars whose situations were formerly marked with precision, are no longer to be found; new ones have also been discovered, which were unknown to the ancients; while numbers seem gradually to vanish, and others appear to have a periodical increase and decrease of magnitude. Dr. Herschel, in the Philosophical Transactions for 1783, has given a large collection of stars which were formerly seen, but are now lost, together with a catalogue of variable stars, and of new stars.—Keith.

On Comets.

Comets are a class of celestial bodies, which appear occasionally in the heavens. They exhibit no visible or defined

disc, but shine with a pale and cloudy light, accompanied with a tail or train turned from the sun. They are found in every part of the heavens, and move in all possible directions.

When examined through a good telescope, a comet resembles a mass of aqueous vapours encircling an opaque nucleus of different degrees of darkness in different comets, though sometimes, as in the case of several discovered by Dr. Herschel, no nucleus can be seen. As the comet advances towards the sun, its faint and nebulous light becomes more brilliant, and its luminous train gradually increases in length. When it reaches its perihelion, the intensity of its light, and the length of its tail, reach their maximum, and sometimes it shines with all the splendour of Venus. During its retreat from the perihelion, it is shorn of its splendour, it gradually resumes its nebulous appearance, and its tail decreases in magnitude till it reaches such a distance from the earth, that the attenuated light of the sun which it reflects, ceases to make an impression on the organ of sight. Traversing unseen the remote portion of its orbit, the comet wheels its ethereal course far beyond the limits of our system. What region it there visits, or upon what destination it is sent, the limited powers of man are unable to discover. After the lapse of years, we perceive it again returning to our system, and tracing a portion of the same orbit round the sun, which it had formerly described.

It would be a waste of time to detail the various wild and extravagant opinions which have been entertained respecting these interesting stars. During the ages of barbarism and superstition they were regarded as the harbingers of awful convulsions, both in the political, and in the physical world. Wars, pestilence, and famine, the dethronement of kings, the fall of nations, and the more alarming convulsions of the globe, were the dreadful evils which they presented to the diseased and terrified imaginations of men. As the light of knowledge dissipated these gloomy apprehensions, the absurdities of licentious speculators supplied their place, and all the ingenuity of conjecture was exhausted in assigning some rational office to these wandering planets. Even at the beginning of the eighteenth century, the friend and companion of Newton regarded them as the abode of the damned. Anxious to know more than what is revealed, the fancy of speculative theologians strove to discover the frightful regions in which vice was to suffer its merited punishment; and the interior caverns of the earth had, in general, been regarded as the awful prison house in which the Almighty was to dispense the severities of justice. Mr. Whiston, however, outstripped all his predecessors in fertility of invention. He pretended not only to fix the residence of the damned, but also the nature of their punishment. Wheeled from the remotest limits of the system, the chilling regions of

darkness and cold, the comet wafted them into the very vicinity of the sun; and thus alternately hurried its wretched tenants to the terrifying extremes of perishing cold and devouring fire.

By other astronomers, comets were destined for more scientific purposes. They were supposed to convey back to the planets the electric fluid which is constantly dissipating, or to supply the sun with the fuel which it perpetually consumes. They have been regarded also as the cause of the deluge; and we must confess, that if a natural cause is to be sought for that great event, we can explain it only by the shock of some celestial body. The transient effect of a comet passing near the earth, could scarcely amount to any great convulsion; but if the earth were actually to receive a shock from one of these bodies, the consequences would be awful. A new direction would be given to its rotatory motion, and the globe would revolve round a new axis. The seas, forsaking their ancient beds, would be hurried by their centrifugal force, to the new equatorial regions; islands and continents, the abodes of men and animals, would be covered by the universal rush of the waters to the new equator, and every vestige of human industry and genius at once destroyed. The chances against such an event, however, are so very numerous, that there is no dread of its occurrence.

Various opinions have been entertained by astronomers respecting the tails of comets. These tails sometimes occupy an immense space in the heavens. The comet of 1681, stretched its tail across an arch of 104 degrees, and the tail of the comet of 1769, subtended an angle of 60 degrees at Paris, 70° at Boulogne, 97° at the isle of Bourbon, and 90° at sea between Teneriffe and Cadiz. These long trains of light were supposed by Appian, Cardan, and Tycho Brahe, to be the light of the sun transmitted through the nucleus of the comet, which they believed to be transparent like a lens. Kepler thought, that the impulsion of the solar rays drove away the denser parts of the comet's atmosphere, and thus formed the tail. Descartes ascribes the tail to the refraction of light by the nucleus. Newton maintained, that it is a thin vapour raised by the heat of the sun from the comet. Euler asserts, that the tail is occasioned by the impulsion of the solar rays driving off the atmosphere of the comet; and that the curvature observed in the tail, is the joint effect of this impulsive force, and the gravitation of the atmospherical particles to the solid nucleus. Mairan imagines, that comet's tails are portions of the sun's atmosphere. Dr. Hamilton of Dublin supposes them to be streams of electric matter; and Biot supposes with Newton, that the tails are vapours produced by the excessive heat of the sun; and also, that the comets are solid bodies before they reach their perihelion;

but that they are afterwards either partly or totally converted into vapour by the intensity of the solar heat.

In the early ages of science, the comets were regarded as an assemblage of small stars that had accidentally coalesced into one body; and afterwards they were believed to be simple meteors or exhalations generated by inflammable vapours in the earth's atmosphere. Some of the ancient philosophers entertained more correct notions of the nature of comets. Some of them considered these bodies as a species of planets that moved in regular orbits beyond the region of the moon; but this was only a sagacious conjecture which they had founded neither on observation nor analogy. It was not till the time of Tycho, that actual observation was called to the aid of theory; and that any well-founded opinion was maintained. By observing the comet of 1577, he found that it had no diurnal parallax; and that it was, therefore, situated at a much greater distance than the moon. Kepler, who at first thought that they described rectilineal paths, afterwards endeavoured to show, that their orbits were parabolic and concave towards the sun. Hevelius entertained the same opinion; but it was left for Sir Isaac Newton to show, that comets revolved like planets round the sun, in eccentric ellipses, stretching far beyond the limits of the solar system, where the aphelion part of the orbit is not drawn on account of its great distance from the sun.

Pursuing the opinion of Sir Isaac Newton, the celebrated Dr. Halley collected all the observations upon comets, and calculated the elements of 24 of them. He was so much struck with the similarity between the elements of the comets of 1456, 1531, 1607, and 1682, that he believed them to be the same comet that had performed three complete revolutions, between 1456 and 1682, with periods of

From 1531 to 1607, 76 years 62 days.
From 1607 to 1682, 74 years 323 days.

Hence he predicted, that the same comet would return in 1757 or 1758; and that its period would be lengthened by the action of Jupiter and Saturn.

This curious subject was taken up by Clairaut, who computed the separate effects produced by Jupiter and Saturn on the motion of the comet of 1682. He concluded, that the attraction of Jupiter ought to lengthen its period 510 days, while that of Saturn should only lengthen it 100; and that instead of 74 years and 323 days, its period should be 76 years and 211 days. As the comet, therefore, passed its perihelion on the 14th September 1682, it ought, by this calculation, to reach the same point of its path on the 13th of April 1759. The appearance of this comet was, therefore, eagerly anticipated as a phenomenon which would establish on an immoveable basis the theory of universal gravitation. It, accordingly, appeared about the end

of December 1758, and arrived at its perihelion on the 13th of March, only 30 days before the time fixed by Clairaut. By repeating his calculations, he afterwards reduced this error to 19 days.

The comet of 1770, appears to have experienced very remarkable changes from the action of the planets. According to Pingre, it moved in an orbit whose major semiaxis was 3.14786, and had a period of 5.43 years. The calculations of Lexell make its major semiaxis 3.14786, and its period 5.585 years. As this comet has never been seen since 1770, the National Institute very lately requested Mr. Burckhardt to repeat all the calculations with the utmost care; and the result of his labour has been a complete confirmation of the elements obtained by Lexell. He found its major semiaxis to be 3.14359, and its period 5.575 years. What has become of this comet it is difficult to say. The aphelion part of its orbit is not far beyond the orbit of Jupiter. It approaches as near to the earth as the moon, and ought to have appeared about 8 times since the year 1770.

We are unwilling to hazard a conjecture upon a subject like this; but the circumstances are so remarkably curious, that we hope to be pardoned for indulging in speculation. We have shewn that the four new planets are the fragments of a large celestial body which once existed between Mars and Jupiter; and we have adduced several arguments to prove that this body may have burst by some internal convulsion. If this body had an atmosphere, each of the four fragments would obviously carry off a portion of it, according to their respective magnitudes; but it is a very singular circumstance, that while two of the fragments, Juno and Vesta, are entirely free from any nebulous appearance, the other two fragments, Ceres and Pallas, are surrounded with a nebulosity of a most remarkable size. In the case of Ceres, this nebulosity is 675 English miles high; while the nebulosity of Pallas extends 468 miles from the body of the planet. It is obvious, that such immense atmospheres could not have been derived from the original planet, otherwise Juno and Vesta would also have been encircled with them; so that they must have been communicated to Ceres and Pallas, since the planet was burst. Now, the comet of 1770, if it is lost, must have been attracted by one of the planets whose orbit it crossed, and must have imparted to it its nebulous mass; but none of the old planets have received any addition to their atmosphere; consequently, it is highly probable, that the comet has passed near Ceres and Pallas, and imparted to them these immense atmospheres, which distinguish them from all the other planets. We have not room to detail the other arguments in support of this theory, which may be drawn from the position of the orbits of the comet and the two planets.

Tabular View of the Solar System.

Names of the Planets.	Mean diameters in English miles.	Mean distances from the Sun, in round numbers of miles.	The correct mean distances, that of the Earth being 100000.	Mean apparent diameters, as seen from the Earth.	Mean diameters, as seen from the Sun.	Densities, that of water being 1.	Proportional quantities of matter.	Diurnal rotations round their own axis.	Inclinations of axes to orbits.	Inclinations of orbits to the ecliptic in 1780.
The Sun	883246			32′ 1″.5		$1\frac{2}{15}$	333928	25d 14h 8′ 0″	82° 44′ 0″	
Mercury	3224	37,000,000	38710	10	16″	$9\frac{1}{6}$	0.1654	14 24 5 28		7° 0′ 0″
Venus	7687	68,000,000	72333	58	30	$5\frac{11}{15}$	0.8899	0 23 20 54		3 23 35
The Earth	7911,73	95,000,000	100000		17 .2		1	1 0 0 0	66 32	0 0 0
The Moon	2180	95,000,000	10 00	31 8	4 .6	$4\frac{1}{2}$	0.025	29 17 44 3	88 17	5 9 3 at a mean.
Mars	4189	144,000,000	152369	27	10	$3\frac{2}{7}$	0.0875	0 24 39 22	59 22	1 51 0
Ceres	163 1024	263,000,000	276500	1 6 .4		2				10 37 0 in 1804.
Pallas	80 2099	265,000,000	279100	0 .5 6 .5		2				34 50 40 in 1804.
Juno	1425	252,000,000	265700	3				27 hours probably.		21 0 13 4 in 1804.
Vesta	238	225,000,000	237300	0 .5						7 8 46 in 1809.
Jupiter	89170	490,000,000	520279	39	37	$1\frac{1}{24}$	312.1	0 9 55 37	90 nearly.	1 18 56 in 1780.
Saturn	79042	900,000,000	954072	18	16	$0\frac{13}{32}$	97.76	0 10 16 2	60 probably.	2 29 50 in 1780.
Georgium Sidus	35112	1,800,000,000	1908352	3 54		$0\frac{99}{100}$	16.84			0 46 20 in 1780.

Tabular View of the Solar System.

Names of the Planets.	Tropical revolutions.	Names of the Planets.	Tropical revolutions.
The Sun		Pallas	
Mercury	87^{d} 23^{h} 14′ 32″.7	Juno	1589^{d}
Venus	224 16 41 27.5	Vesta	1155 4^{h}
The Earth	365 5 48 49	Jupiter	4330 14 39 2
The Moon		Saturn	10746 19 16 15.5
Mars	686 22 18 27.4	Georgium Sidus	30637 4 0 0
Ceres	1681 12 9		

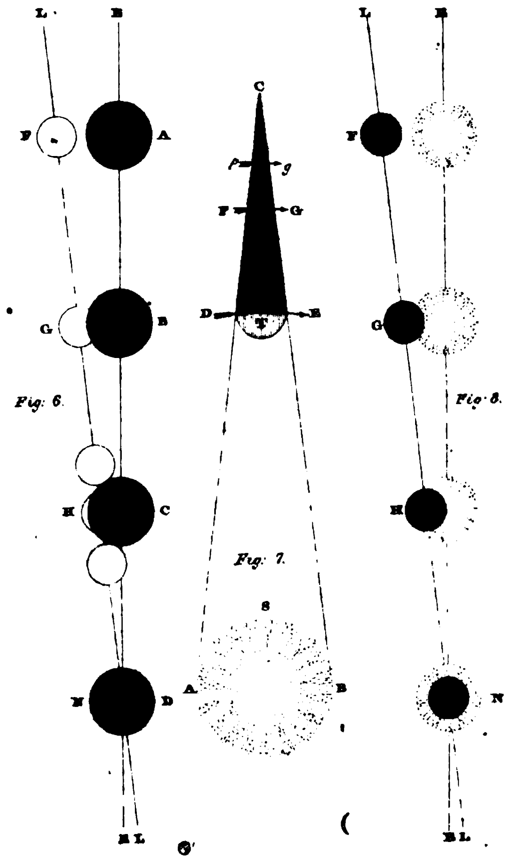
FERGUSON.

Eclipses.

In a period somewhat shorter than a month, the moon is found once in conjunction, and once in opposition with the sun. In conjunction, when the moon is at N., Pl. XXII. fig. 2, between the sun S, and the earth T; and in opposition, when the moon is at L, in such a situation that the earth T is between it and the sun. In the first case we should naturally expect that the moon would hide from us the light of the sun; and in the second, that the earth would prevent the sun's light from reaching the moon; and consequently, that every such occasion would produce an eclipse of one of those bodies. Notwithstanding this, we find the new and full moons but very seldom produce eclipses; and when they happen, it is not in the same proportions or in the same manner as you might expect on a cursory view of the figure.

If the moon's orbit was perfectly coincident with that of the earth, what we have been supposing would actually take place, and there would be a total eclipse at every new and full moon; but Providence has wisely ordered it better, and I think I shall be able in a few words to explain the reasons to your satisfaction. The moon's orbit is inclined about five degrees to the plane of the ecliptic, or the orbit of the earth. When, therefore, the moon in the moment of her conjunction with the sun, happens to be in any point of her orbit a little distant from those points in which this orbit cuts the ecliptic, and which are called the nodes, there is sufficient latitude to admit of the light passing to the earth either above or below the moon, and there can therefore be no eclipse. Or, when, in a similar case, the moon happens to be in opposition, the light of the sun will pass to her

Plate XXIII



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either above or below the earth, and the moon will not be eclipsed. But if the moon happens to be in the node, or very near it, at the time of her conjunction, she will then hide from us the light of the sun, and that luminary will be eclipsed: if, on the contrary, she happens to be in or near her node, while in opposition to the sun (being then in the plane of the earth's orbit), the earth will intercept from the moon the sun's light, and she will suffer an eclipse.

You must consider that it is only when the sun and moon happen to be in conjunction or opposition in or near one of the nodes that an eclipse can take place. When, in fact, the sun and moon are more than seventeen degrees from either of the nodes at the time of conjunction, the moon is then too high or too low in her orbit for any part of her shadow to fall on the earth; and when the sun is more than twelve degrees from either of the nodes at the time of opposition, the moon is too high, or too low, to pass through any part of the earth's shadow. Her orbit contains 360 degrees; of which seventeen, the limit of the solar eclipses on either side of the nodes, and twelve, the limit of lunar eclipses, are but small portions; and as the sun passes by the nodes but twice in a year, it is no wonder that we have so many new and full moons without eclipses.

The eclipse of the moon then can only take place at its full, and when the moon is in opposition to the sun, and the moon is found either in one of his nodes, or near it. Suppose E E (Plate XXIII. fig. 6.) to be a portion of the ecliptic at the distance of the moon, along which the shadow of the earth is moving. This shadow is represented by the black circular spots A B C D, which may be conceived to be sections of the cone D C E in fig. 7, where S is the sun, and T the earth. Suppose again the line L L (fig 6.) to be a portion of the orbit of the moon, which cuts the ecliptic E E in the point N, called the *node*, making with it an angle of a little more than five degrees. If, in the moment of her opposition, the moon is found in the point F in her orbit, she will be too far from her node, which is in N, and will have too much latitude to be able to reach the shadow. But if she is in the point G, having less latitude, a portion of her disc will be plunged in the shadow. There will then be a partial eclipse, and if the moon is still nearer to her node, as at the point H, the greater the obscuration will necessarily be.

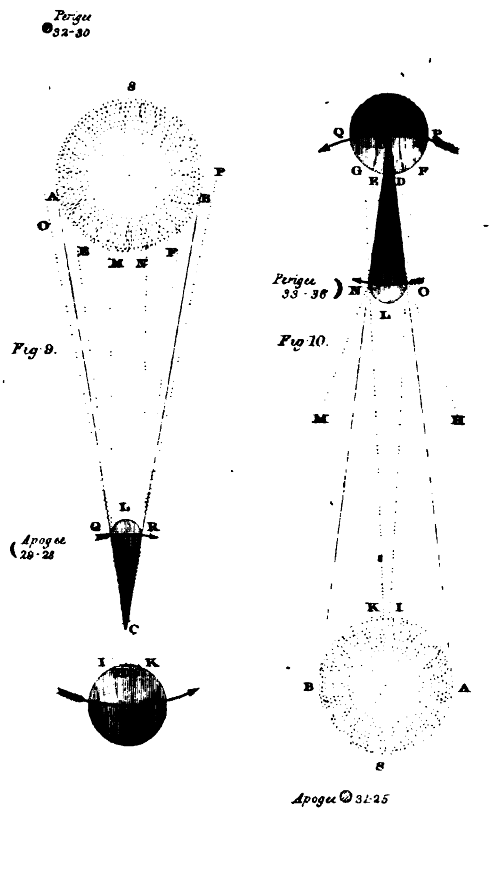
In short, if in the moment of opposition the moon is found precisely in her node N, the eclipse will not only be total, but central, and even will remain so for some time; for the centre of the moon coincides with the axis of the conical shadow formed by the earth; and this conical shadow D E C (fig. 7.)

occupying, in the orbit of the moon, a space F G, or *f g*, greater than the diameter of the moon L or M, it shades this planet for a time proportioned to the length by which the diameter of the shadow exceeds that of the moon, and this it is that causes the continuance of this planet in the shadow. The moon remains thus obscured the longest time when the sun S is in apogee, and the moon L in perigee; for then the conical shadow is the greatest that can be; and the moon being in the point L of her orbit, which is the nearest the earth, is found also traversing the shadow in the place where this shadow has the greatest diameter, F G, that the moon can reach; whereas, when the moon M is in apogee, she traverses the conical shadow nearer the summit C, and consequently in a place, *f g*, where the shadow is narrower.

When the moon is even totally eclipsed, she does not cease to be visible, for it is only the shadow of the earth which is cast upon her. She appears of a copper colour, or like a heated iron half extinguished. This arises from the scattered rays of light from the moon, which are refracted by the terrestrial atmosphere, and, crossing each other, afford a faint picture of the moon. This light is feeble, because it is small in quantity, and it is of a reddish colour, because only the red rays can penetrate our atmosphere in these circumstances. Th s is more obscure in proportion as the moon is nearer the earth at the time of the eclipse: there have even been eclipses when the moon has totally disappeared, but this is a rare phenomenon.

An eclipse of the sun can only take place when the moon is in conjunction with the sun, and when she is in one of her nodes, or very near it. Suppose the line E E (fig. 8.) to be a portion of the ecliptic, and L L a portion of the orbit of the moon, cutting the ecliptic in the point N, at an angle of a little more than five degrees. Then, if in the moment of her conjunction the moon is found in the point F of her orbit, she will be too far from her node to intercept the sun's light, and cause an eclipse. But if she is in the point G, having less latitude, she will hide a portion of the disc of the sun; and will then produce a partial eclipse, which would be still greater if the moon was nearer her node, as in the point H. In short, if, in the moment of the conjunction, the moon is precisely in her node N, the eclipse will be central; for the centre of the moon, if viewed from that of the earth, will appear to coincide with the centre of the sun. And if the apparent diameter A B (Plate XXIV. fig. 10.) of the sun is greater than the apparent diameter Q R of the moon L (fig. 9,) it will form round the moon a ring, or a luminous crown; and the eclipse is then called *annular*. This ring of light will be larger in proportion to the difference between the apparent diameters of the sun and the moon. But if the apparent

Plate XXIV



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diameter O N (fig. 10.) of the moon L is equally great or greater than the apparent diameter B A of the sun S, he will appear entirely covered by the moon; the eclipse will then be total, and will endure so much longer as the apparent diameter of the moon shall exceed that of the sun.

For an eclipse of the sun to be annular, the case will be most favourable when the sun is in perigee, and the moon in apogee. And for an eclipse to be total, the most favourable case is when the sun is in apogee, and the moon in perigee.

The motion of the moon being swifter than that of the earth, and the motion of both being directed from west to east, that is, that of the moon from Q to R (fig. 9.), and from N to O (fig. 10.) and that of the sun from A to B, it will easily be seen that an eclipse of the sun must always begin in its western edge A.

As the moon is a great deal less than the earth, her shadow forms a cone N O C (fig. 10.) whose section is much less than the earth, so that only a small portion, D E, of the earth is involved in the shadow at one time. Hence it is that an eclipse of the sun is not perceived at the same instant in every part of the hemisphere which is thus turned towards the sun, and that in some parts it will not be seen at all. Moreover, in different situations, different parts of the sun's disc will appear eclipsed; for those who are in F see him eclipsed in the part I B and those who are in G see him eclipsed in the part K A. On the contrary, an eclipse of the moon is perceived at the same moment in every part of the earth where this planet is visible, and appears every where to occupy the same portion of her disc. It is for this reason that eclipses of the sun are much less frequent in any particular place than eclipses of the moon.

If the moon's nodes constantly corresponded with the same points in the heavens, the eclipses, whether of the sun or the moon, would take place in the same months, and even on the same days; but as the nodes shift backwards, or contrary to the earth's annual motion about 19½ degrees in the year, the same node will come round to the sun about 19 days sooner every year than in the preceding. From the time, therefore, when the ascending node passes by the sun, as seen from the earth, there will be only 173 days before the descending node passes by him. If, then, at any time of the year we have eclipses about either of the nodes, we may expect about 173 days after to have eclipses about the other node.

The nodes shift through all the signs and degrees of the ecliptic in eighteen years and 225 days; and in this time there would always be a regular return of eclipses, if any complete number of lunations were finished without a fraction. But this

never happens; for if both the sun and moon should set out together from a line of conjunction with either of the nodes, in any point of the ecliptic, the sun would go through eighteen annual revolutions, and 222 degrees over, and the moon through 230 lunations and 85 degrees of the 231st, by the time the nodes came round to the same point of the ecliptic again; and therefore the sun would then be 138 degrees from the node, and the moon 85 degrees from the sun.

After the sun, moon, and nodes, however, have been once in a line of conjunction, they will return nearly to the same state again in 223 mean lunations, or about eighteen years and ten days, so that the same node which was in conjunction with the sun and moon at the beginning of the first of these lunations, will be within less than half a degree of the line of conjunction with the sun and moon again, when the last of these lunations is completed. In that time, therefore, there will be a regular period of eclipses, or returns of the same eclipses, for many ages. But the falling back of the line of conjunction of the sun and moon, with respect to the line of the nodes in every period, will at length exhaust it, and after that it will not return again in less than 12,492 years.

If these principles are properly considered, it will not be difficult to conceive how astronomers are able to foretel the exact time when any phenomenon of this kind will happen. For, as an eclipse can only take place at the time of a new or full moon, the chief requisites are to determine the number of mean conjunctions and oppositions that will arrive in every year, and the true places of the sun and moon in their orbits at each of those times. And, if from this it appears that the two luminaries are within the proper limits of the node, there will be an eclipse, or otherwise not, agreeably to what has been already observed upon this subject.

But in order to facilitate these operations, we have astronomical tables ready computed, by which the places of the heavenly bodies and every other necessary particular may be easily found for any given instant of time. Dr. Halley has also given a catalogue of all the eclipses that took place from the year 1701 to 1718, which the author of "L'Art de Verifier les Dates," and others, have continued up to the year 1800.

In De Lalande's History of Astronomy for the year 1800, it is asserted that M. Goudin has, by his analysis, fully determined the eclipse of 1847, the most considerable of the new century. That M. Duvancel, who has delineated eclipses for thirty years past, has likewise delineated this for every country on the globe. By his diagram it appears that it will be annular in England, France, Turkey, and even in Cochin-China.

In all eclipses, whether of the sun or moon, there are three points particularly to be observed, the beginning, the middle, and the end; and every precaution is taken to note the precise moment of each of these three phases. In total eclipses there are two other phases to be observed, these are the total immersion and the commencement of the emersion. In total eclipses, then, there are five phases to be observed, the commencement of the immersion, which is the commencement of the eclipse; the total immersion; the middle of the eclipse; the commencement of the emersion; and the total emersion, which is the end of the eclipse.

There is also another circumstance to be observed in every eclipse, namely, its greatness or extent, that is, the portion of the luminary eclipsed, or which is covered by the shadow. To measure this, the diameters of the sun and moon are supposed to be divided into twelve equal parts, which are called *digits*; and an eclipse is said to be so many digits, according to the number of those parts which are obscured. In total eclipses of the moon, it is often said to be eclipsed more than twelve digits, though the diameter of the moon is only estimated at that number. The expression then implies that the earth's shadow covers more than the disc of the full moon, and the shadow is measured as if it was a part of the luminary eclipsed.—GREGORY.

On the Distance and Magnitudes of Planets.

Astronomy furnishes us with a variety of methods for determining the distances of the celestial bodies; but as many of them are involved in long calculations, which are intelligible only to mathematicians, I shall confine myself to those which admit of the most familiar explanation; and endeavour, by that means, to set the subject in so clear a light, that you can no longer doubt of the possibility of resolving this curious problem. We will first begin with the moon: this planet is nearer to us than any of the rest, and the method of finding her distance from the earth being once known, it will be easy to perceive that the distance of any other planet may be determined in nearly the same way.

The first thing to be done, in the method I am about to describe, is to find the moon's horizontal parallax, or the difference between the place of the moon when she appears in the horizon, to a spectator on the earth's surface, and her place as it would appear to a spectator placed at the earth's centre. This problem is no less curious than the one it is meant to elucidate:

it is the same thing as to find the angle under which the semidiameter of the earth would appear at a certain time, to an observer placed at the centre of the moon. That this can be done, must appear very extraordinary to a person unacquainted with astronomical principles; but the determination, singular as it may seem, is far from being impracticable.

It will be sufficient to shew you the bare possibility of the thing, without entering into the minutiæ of practice. For this purpose, let us suppose an observer to be placed upon any point A, of the equator B A C, (Plate XXVI. Fig. 1.) at the time the moon moves in the equinoctial D M P; then, as this latter circle is in the plane of the former, the moon will pass directly over his head, and descend perpendicularly to the horizon E N. In this situation of the spectator upon the earth's surface at A, the moon will appear to have described a quarter of a circle or ninety degrees, in passing from the zenith M to the sensible horizon at N; whilst to a spectator placed at the centre of the earth O, she would appear to have described a quarter of a circle when she came to the rational horizon at P. But the moon revolves round the earth, from the meridian to the meridian again, in about twenty four hours and forty-eight minutes; she will therefore revolve from M to P, in six hours and twelve minutes; and if the time she takes in moving from M to N be found by observation, and taken from six hours twelve minutes, the time of moving from M to P, the remainder will be the time employed in describing the arc N P.

Having thus found the measure of the arc N P in time, we can convert it into degrees and minutes, as follows: As the time of describing the arc M N, which is found by observation, is to ninety degrees, so is the time of describing the arc N P, to the degrees and minutes in that arc. But this arc is the measure of the angle N O P, or of its equal O N A; for since the lines A N and O P are parallel to each other, it is a known property of geometry, that the angle N O P will be equal to the angle O N A. This angle O N A is called the moon's horizontal parallax, and as that is now found, we can easily determine the distance of the moon from the earth's centre. For it is a maxim in trigonometry, that when any three things in a plane triangle are known, except the three angles, the rest may be found by calculation.

Now, in the triangle A O N we have the side O A, equal to half the diameter of the earth, which, from an actual mensuration of the circumference, has been found to be about three thousand nine hundred and sixty miles; the angle O N A, or the moon's horizontal parallax, has also been found by observation; and the angle O A N is a right angle, because O A is

perpendicular to the sensible horizon E N. These three things, therefore, are known, and are sufficient data for determining the rest. The side of the triangle O N is the distance of the moon from the centre of the earth O; and this distance, by a single trigonometrical operation, is found to be, at a mean rate, about sixty semidiameters of the earth, or in round numbers, about two hundred and forty thousand miles.

But the true quantity of the moon's horizontal parallax cannot be accurately determined by this method, on account of the varying declination of the moon, and the inconstancy of the horizontal refractions, which are perpetually changing according to the state the atmosphere is in at the time. For the moon continues but for a short time in the equinoctial, and the refraction, at a mean rate, elevates her apparent place, near the horizon, half as much as her parallax depresses it. Astronomers have, therefore, thought of the following method, which is free from these objections; and if practised by able observers, with good instruments, is sufficient for determining the parallax and distance of the moon to a considerable degree of precision.

I shall mention the most simple case first, and this will render the general method more clear and satisfactory. Suppose two observers were placed under the same meridian at A and B (Plate XXVI. fig. 2.) at such a distance from each other, that the one at A sees the moon M in his horizon, whilst the other at B sees her in the zenith; then will the distance of the moon O M, and the horizontal parallax O M A, be easily determined. For the arc A B, which measures the angle O, is equal to the difference of latitude of the two observers; the side O A is equal to three thousand nine hundred and sixty miles, as before; and the angle O A M is a right angle. In the triangle M A O, therefore, there is given one side and two angles; and consequently the side O M, or the distance of the moon from the centre of the earth, may be found by trigonometry, as in the former example. And if the angle A O B be taken from ninety degrees, it will give the angle A M B, which is the moon's horizontal parallax.

This is the simplest solution the problem admits of; but as it may not be easy to perceive how the two observers can be placed in the manner required, I shall now give you a more general method, by which the distance of the moon from the earth may be determined, when the observers are situated at any two distant places under the same meridian. Suppose, for example, that the two observers were at the points A and B (Plate XXVI. fig. 3.) the distance of which A B, or their difference of latitude, has been previously found, by the rules already laid down for that purpose; then if the zenith distances of the

moon Z M and Z M, be each taken, with a good instrument, at the moment when she passes the meridian Z Z, the distance of the moon M O from the centre of the earth may be determined as follows:

In the triangle A B O, O A and O B are each equal to the radius of the earth, or three thousand nine hundred and sixty miles; and the angle A O B is measured by the arc A B, which is the difference of latitude between the two observers at the time of observation. These three things therefore being known, the side A B, and the angles O A B and O B A, can be found by calculation. And if the angles M A Z and M B Z, which are measured by the zenith distances M Z and Z M, be each taken from a hundred and eighty degrees, the remainders will be the angles O A M and O B M; it being a known property in geometry, that a straight line standing upon another straight line, makes with it two angles, which, taken together, are equal to two right angles.

From the angles O A M and O B M, thus determined, take the angles O A B, and O B A, which have been found by calculation, and there will remain the angles M A B and M B A: so that in the triangle A B M, we shall have these two angles, and the side A B; and consequently the side M B may also be found as before. This is sufficient for our purpose; we have now, in the triangle O M B, the two sides M B and B O, and the included angle O B M, from which the side O M, or the distance of the moon from the centre of the earth, may be determined. This might have been done in a shorter way, by first finding the horizontal parallax; but as that method depends upon a theorem in trigonometry, the demonstration of which does not admit of a familiar explanation, I chose rather a more prolix manner, for the sake of greater perspicuity.

The distance of the sun from the earth might be determined in nearly the same manner as that of the moon, if his horizontal parallax was not so small as to be scarcely perceptible; for it is well known, that the angle O S A, (Plate XXVI. fig. 4.) under which the semidiameter of the earth would appear to a spectator in the sun, can never exceed nine seconds, or the four-hundredth part of a degree. And as a mistake of one second, in so small an angle, will occasion an error of about seven millions of miles in the distance, it is easy to perceive what an extraordinary degree of skill it must require, to surmount the difficulties attending this delicate subject.

But the mind grows stronger by frequent exertions, and genius and industry conquer difficulties apparently insurmountable. The vast bulk of the earth has been accurately measured; the stars of heaven have been numbered; and the immense

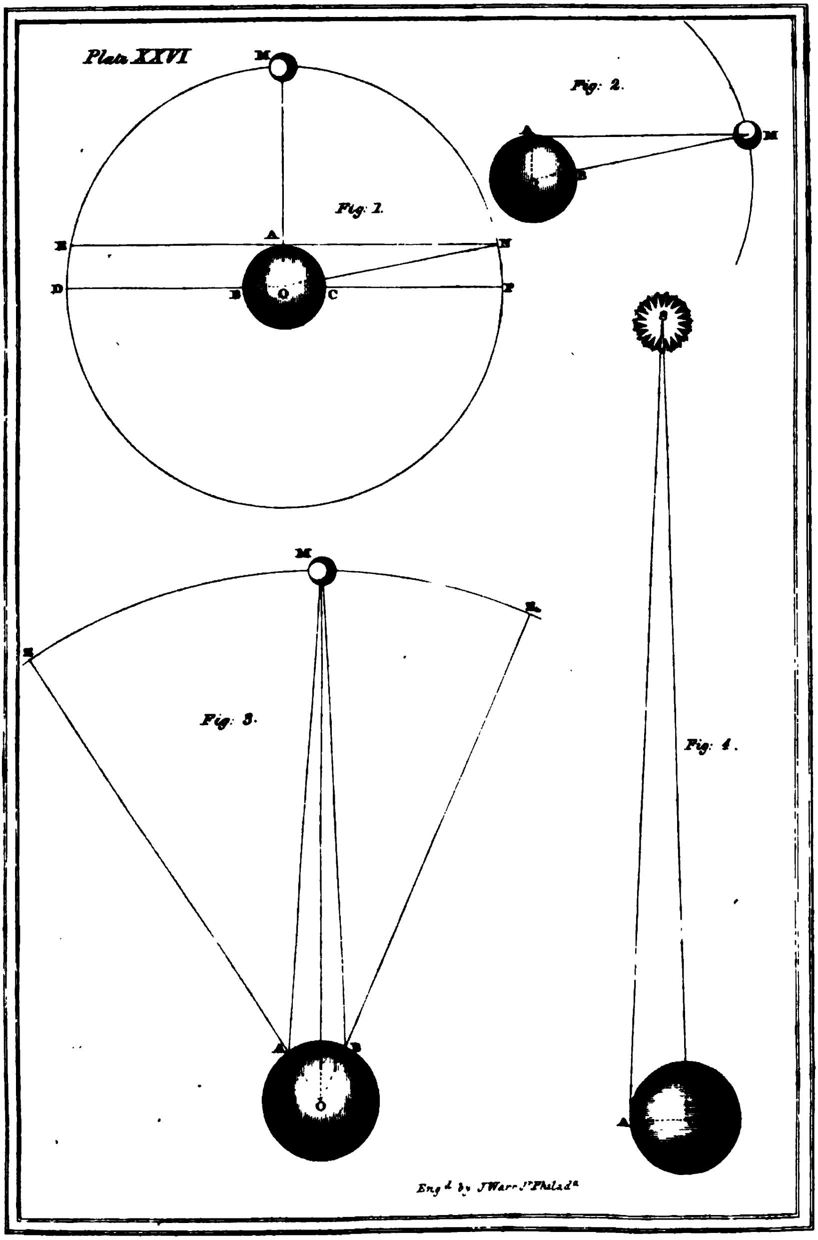


Plate XXVI
Fig: 1.
Fig: 2.
Fig: 3.
Fig: 4.
M
A
E
N
D
B
O
C
F
S
Eng^d by J Warr J^r Philad^a

distance of the sun is now subjected to a rigorous calculation. By means of the transit of Venus over the sun's disc, which happened in the years 1761 and 1769, this problem was resolved with a degree of precision, unlooked for by the astronomers of ancient times. The person to whom we are indebted for this excellent method, is Dr. Edmund Halley; a man, whose skill and penetration in all mathematical and philosophical inquiries, entitle him to an eminent place in the classes of literature and science. A few extracts from the Dissertation which he presented to the Royal Society upon this subject, will show you the spirit of his method, and enable you to enter into the illustration of it with th. greater facility.

"There are many things," the Doctor observes, "that appear extremely paradoxical, and even quite incredible to the illiterate, which yet, by means of mathematical principles, are easily solved. Scarcely any thing will be thought more difficult than that of determining the distance of the sun from the earth; but this, when we are made acquainted with some exact observations, taken at places fixed upon, and chosen beforehand for that purpose, may, without much labour, be easily effected.

"There remains then, the transit of Venus over the sun's disc, whose parallax, being almost four times as great as the solar parallax, will cause very sensible differences between the times in which Venus will seem to be passing over the sun from different parts of the earth. And from these differences, if they be properly observed, the sun's parallax may be determined, even to a small part of a second. Nor are any other instruments required for this purpose, than common telescopes, and clocks, which are good of their kind; and in the observers, nothing more is requisite than fidelity, diligence, and a moderate skill in astronomy.

"For there is no need that the latitude of the place should be scrupulously observed, nor that the hours themselves should be accurately determined with respect to the meridian: it is sufficient that the clocks be regulated according to the motion of the heavens, provided the times be accurately reckoned from the total ingress of Venus into the sun's disc, to the beginning of her egress from it; that is, when the dark globe of Venus first begins to touch the bright limb of the sun, it may be observed to within a second of time.

But on account of the very strict laws by which the motions of the planets are regulated, Venus is seldom to be seen within the sun's disc; and during the course of one hundred and twenty years it could never be once observed; namely, from the year 1639 to the year 1761."

The Doctor having pursued his subject thus far, in this popular and easy way, proceeds to illustrate it by a figure; but as

he has introduced several things into his calculation which could not be understood by a person unacquainted with mathematical principles, I shall endeavour, by means of a simple unembarrassed scheme, to give you such an idea of the matter, as will at once convince you of the practicability and certainty of this method. The two last transits were in the years 1761 and 1769, and as there will not be another before the year 1874, when most of the human race, now living, will in all probability be dead, it will be unnecessary to trouble you with a long account of the methods made use of for observing these eclipses with accuracy and precision, or to enter into any other particulars, than what are sufficient for our present purpose.

The diameter of the earth is but a point in comparison to the distance of the sun; and therefore if the sun were viewed at the same instant, by two observers, on opposite sides of the earth, his centre would appear to both of them to be exactly in the same point of the heavens. But when Venus is between the earth and the sun, as she was at the time of her late transits, her distance from the earth is between three and four times less than that of the sun. And consequently, if Venus be then viewed by two observers on the earth, who are at a great distance from each other, she will appear to each of them to be on different parts of the sun's surface at the same instant.

Thus let S be the sun, (Plate XXV. Fig. 1.) V Venus, and A B D E the earth; and let one observer be at A, another at B, and a third at D, all looking at Venus at the same moment of absolute time. Then, to the observer at A, Venus will appear upon the sun at F; to the observer at B, she will appear upon the sun at G; and to the one at D she will appear upon the sun at H. Or if Venus be supposed to be at rest at V, whilst the observer is carried by the earth's motion on its axis, from A to D, through the arc A B D, it is plain that the planet V will then appear to have moved on the sun from F to H, through the space F G H.

Let us now suppose the earth *a b d e* (Fig. 2.) to be nearer the sun S, than as represented in fig. 1; in which case Venus (*v*) will be proportionally nearer to the earth; and the arc *a b d* through which the observer is carried, will bear a greater proportion to the distance of Venus (*v*) from the earth, in fig. 2, than the same arc A B D bears to the distance of Venus (v) from the earth, in fig. 1. So that if one observer should be placed at *a*, another at *b*, and a third at *d*, the observer at *a* would see Venus on the sun at *f*; the observer at *b* would see her on the sun at *g*; and the one at *d* would see her on the sun at *h*; all at the same instant of time.

Or if Venus continued at rest at *v*, whilst the observer at *a* was carried from *a* to *d*, by the earth's motion, Venus, in that time, would appear to him to have moved from *f* to *h*, on the

sun. But the line *f g h*, in fig. 2, is longer than the line F G H in fig. 1; and therefore the nearer the earth is to the sun, the greater will the space be through which Venus appears to move upon the solar disc, by the observer's real motion along with the earth, in any given time: and the further the earth is from the sun, the less will the space be through which Venus appears to move upon the solar disc, by the observer's real motion in the same time.

And, consequently, as Venus is really moving in her orbit in the direction T V W, (fig. 1.) or *t v w*, (fig. 2.) whilst the observer is carried by the earth's motion on its axis from A to D, or from *a* to *d*, it is plain, that she will appear to move sooner over the sun, if the earth's distance be only *b v s* (fig. 2.) than if it be B V S, (fig. 1.) So that the whole duration of her transit over the sun must be shorter, if the earth's distance be only *b v s*, than if it be B V S.

This being properly understood, let us now suppose the earth to be a transparent globe, like glass, and that a person was placed at the centre C (fig. 3.) and kept looking at the sun S, during the time in which Venus moves in her orbit from F to *f*, through the space F G V *g f*. In this case the earth's motion on its axis could have no effect on his position, because it could not carry him away from the point C; and therefore when Venus is at F, in her orbit, she would appear to be just within the sun's surface, touching his eastern edge at K, at her first internal contact with him; and as she moves on from F to *f*, in her orbit, she would appear to pass over the sun, from K to L, in the line K *k* L, which is called the line of her transit over the sun. And when she is at *f*, in her orbit, she would appear to be just beginning to leave the sun's western edge at L, at her last internal contact with him. So that if Venus could be seen from the earth's centre C, she would move from F to *f*, in her orbit, in the time she would appear to move from K to L on the sun, or from her first internal contact to her last.

This being the appearance of the transit at the earth's centre, let us now suppose, that the observer is placed on the surface at *a*, and that he is carried from *a* to *b*, by the motion of the earth on its axis in the same time that Venus moves from F to *f* in her orbit. Then, when Venus is at F, she will appear on the sun at K, as seen from the earth's centre, whilst to the observer at *a*, she will not yet be come to the sun; but if she were then visible, would be seen in the line *a* F H towards the east, and must move on from F to G in her orbit, before the observer would see her on the sun at K, in the right line *a* G K. So that her transit will begin as much later to the observer at *a*, than it does to the observer at C, as she is in moving from F to G, in her orbit.

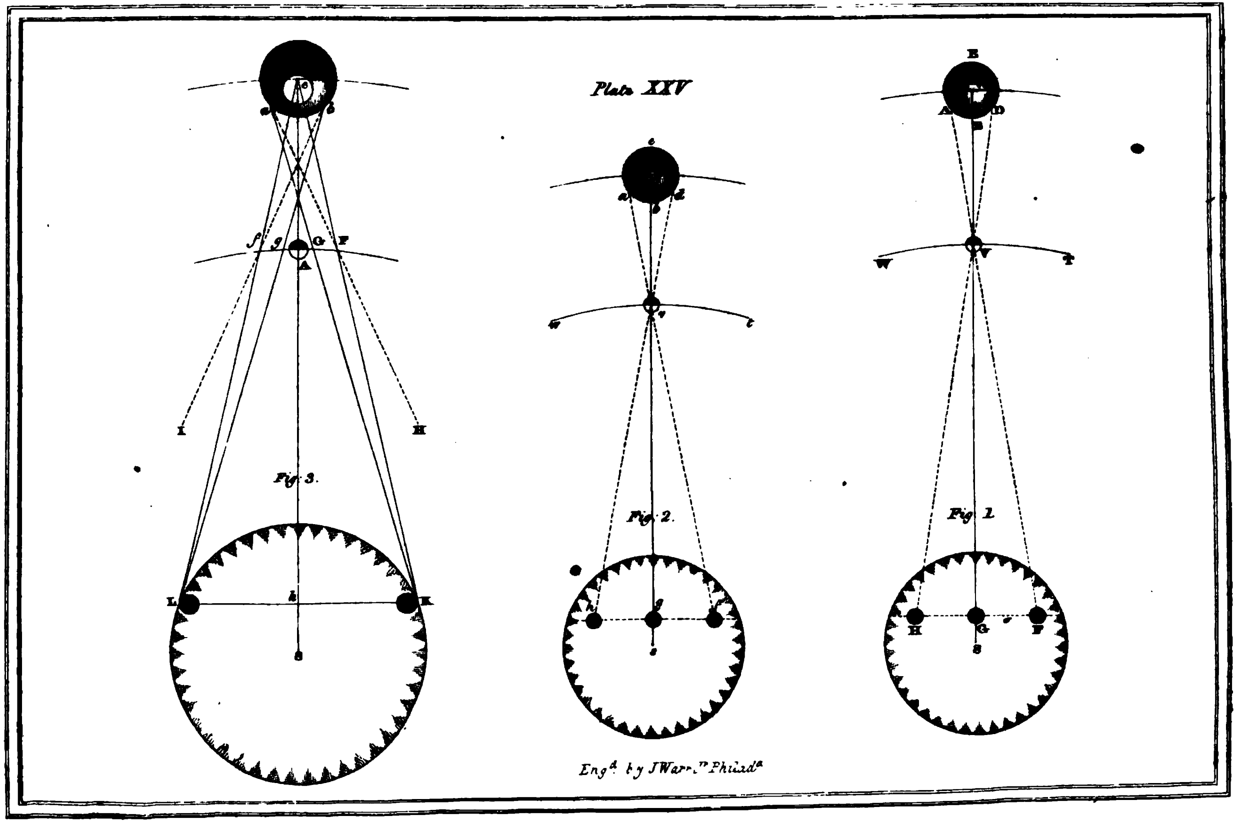
When Venus comes to *g* in her orbit, the observer will be carried from *a* to *b*, by the earth's motion, and he will then see her in the line *b g* L, just beginning to leave the sun at L; but she must move on from *g* to *f* in her orbit, before she begins to leave the sun at L, as seen from the earth's centre C, in the right line C *f* L; and then, to the observer at *b*, she will appear quite clear of the sun to the west, in the line B *f* I. So that the whole duration of the transit, from K to L on the sun, will be shorter as seen by the observer in motion, from *a* to *b*, than as seen by the supposed observer at rest at the earth's centre C. For to the former she will move only from G to *g* in her orbit, during the time she appears to move from K to L on the sun: but to the latter she must move from F to *f* in her orbit, in the time she appears to pass over the sun from K to L.

And the nearer the earth is to the sun, the greater will the difference of the durations of the transit be, as seen from the earth's surface, and from its centre: and the further the earth is from the sun, the less will the difference between the durations of the transit be, as seen from the earth's surface, and from its centre. For it is plain, from the first and second figures, that the nearer the earth is to the sun, the nearer also, in proportion, will it be to Venus; and the further it is from the sun, the further also it must be from Venus. So that the space through which the observer is carried, by the earth's motion, will bear a greater proportion to the distance of Venus from the earth, in the former case than in the latter, and must therefore affect the times of the durations of the transit, as seen from the earth's centre, and from its surface accordingly.

Now, as the apparent breadth of the sun is known, and the time of Venus's going round him is also known, the time of her appearing to move through a space equal to the sun's breadth is easily calculated, and is the same as would be observed by a person placed at rest at the earth's centre. And as it appears, from what has been said, that the difference of the durations of the transit, as seen from the earth's surface, and from its centre, is greater or less, according as the sun is nearer to or further from the earth, it will be easy to find what this difference must be at all kinds of distances of the sun from the earth. The observer, therefore, by knowing how much shorter the duration of the transit appears to him upon the earth's surface, than it would have done if he had been at rest at the centre, may readily find the distance of the sun from the earth, which was the thing to be determined.

The transits which happened in the years 1761 and 1769, were observed with the greatest diligence and accuracy by some of the most eminent astronomers in Europe, who were sent out to the most convenient parts of the earth for that purpose; and

Plate XXV



from their determinations it appears, that the horizontal parallax of the sun is, at a mean, about eight seconds and a half, and his distance from the earth, in round numbers, about ninety-five millions of miles. A distance so prodigious, that a cannon ball, which moves at the rate of about eight miles in a minute, would be something more than twenty-two years in going from the earth to the sun; and if a spectator could be placed in the sun, and was to look at the semidiameter of the earth, this line, which is about four thousand miles long, would only appear to him under an angle of about eight seconds and a half. Consider this, and you will find it a subject worthy of your admiration.

The distance of the sun from the earth being thus found, the distances of all the rest of the planets may be easily determined, by the stated laws of nature. For it was discovered by Kepler, from observation, that the squares of the periodic times in which the planets perform their annual revolutions, are in proportion to each other as the cubes of their mean distances from the sun; so that the distance of any one of them being known, the distance of any other may be easily determined. Suppose, for example, that I wanted to know the distance of Saturn from the sun; this may be performed by the rule of proportion, as follows: As the square of the time in which the earth performs her revolution round the sun, is to the square of the time in which Saturn performs his revolution round the sun, so is the cube of the earth's mean distance from the sun, to the cube of the mean distance of Saturn; and if the cube root of this last number be taken, it will give the distance of Saturn from the sun, as was required.

And in a manner, equally easy, may the real diameters and bulk of the planets be determined, from their apparent diameters and distances being known. The sun and moon for instance, appear nearly of the same magnitude; and, therefore, if the sun's distance from the earth be reckoned at ninety-five millions of miles, his solid bulk, in order that he may appear as large as the moon, whose distance does not exceed two hundred and forty thousand miles, must be sixty-four millions of times as great as that of the moon's. Again, the earth's diameter, as seen from the sun, at the time of his mean distance, subtends an angle of double the sun's horizontal parallax, which is now supposed to be eight and a half seconds; and the sun's diameter, as seen from the earth, at that time, is found to be about thirty-two minutes; whence the sun's diameter is to the earth's as three hundred and forty to three. And, since the bulks of spherical bodies are to each other as the cubes of their diameters, the sun's bulk will be found to be something more than a million of times larger than that of the earth. And, in

the same manner, may the diameters and bulks of the rest of the planets be readily determined.—BONNYCASTLE.

Why the Earth at every Revolution be not nearer and nearer the Sun. Plate XXVII. Fig. 1.

From the uniform projectile motion of bodies, in straight lines, and universal power of attraction, which draws them off from these lines, the curvilineal motions of all the planets arise. If the body A be projected along the right line A B X in open space, where it meets with no resistance, and is not drawn aside by any other power, it will forever go on with the same velocity and in the same direction; for the force which moves it from A to B in any given time, will carry it from B to X in as much more time, and so on, there being nothing to obstruct or alter its motion. But when the projectile force has carried it to B, the body S begins to attract it, it will then be drawn from the straight line A B X, and is forced to revolve about S.

As the planets approach nearer the sun, and recede farther from him in every revolution, there may be some difficulty in conceiving the reason why the power of gravity, when it once gets the better of the projectile force, does not bring the planets nearer and nearer to the sun in every revolution, till they fall upon and unite with him, or why the projectile force, when it once gets the better of gravity, does not carry the planets farther and farther off from the sun, till it removes them quite out of the sphere of his attraction, and cause them to go on in straight lines for ever afterward. But by considering, suppose a planet at B to be carried by its projectile force from B to F in the time that gravity would have brought it down from B to C, by these two forces it will describe the curve B D. Again, supposing the planet to be carried by the projectile force from B to X in the time that gravity would have brought it down from B to C; by these two forces it will describe the curve B Y. When the planet comes down to K it will be but half as far from the sun as it was at B. While the gravitating power increases, the projectile power also increases; so that the planet cannot be drawn to the sun. Suppose a planet at K to be carried by the projectile force from K to W in the time that gravity would have brought it down from K to V; by these two forces it will describe the curve K L. From the above causes it is plain that the planet will describe the curve from K to L in half the time it did from B to D, although the space be the same length, &c.

Projectile force is that force which carries a body off in a straight line.

Centripetal force is that force with which a moving body is

continually urged towards the centre, and made to revolve in a curve, instead of proceeding in a straight line. All motions are naturally rectilinear. Centripetal force, attraction, and gravity are terms of the same import.

Centrifugal force is that force with which a body revolving about a centre, or about another body, endeavours to recede from the centre or body.

There are two kinds of centrifugal force, viz. that which is given to bodies moving round another body as a centre, and that which bodies acquire by revolving upon their own axes. The annual orbit of the earth round the sun is described by the action of the centripetal and projectile forces, and the diurnal rotation of the earth on its axis gives to all its parts a centrifugal force proportional to its velocity.

A double projectile force is equal to a quadruple centripetal force.

If the projectile force and centripetal force were equal, the earth would perform a complete circle round the sun.

On the Atmosphere.

In all observations, to have the true altitude of the sun, moon, or stars, the refraction must be subtracted from the observed altitude. But the quantity of refraction is not always the same at the same altitude; because heat diminishes the air's refractive power and density, and cold increases both; and, therefore, no one table can serve precisely for the same place at all seasons, nor even at all times of the same day; much less for different climates; it having been observed that the horizontal refractions are near a third part less at the equator than at Paris, as mentioned by Dr. Smith in the 370th remark on his Optics, where the following account is given of an extraordinary refraction of the sun-beams by cold:—"There is a famous observation of this kind made by some Hollanders that wintered in Nova Zembla in the year 1596, who were surprised to find, that, after a continual night of three months, the sun began to rise 17 days sooner than according to computation, deduced from the altitude of the pole, observed to be 76°: which cannot otherwise be accounted for, than by an extraordinary refraction of the sun's rays, passing through the cold dense air in that climate. Kepler computes, that the sun was almost 5° below the horizon when he first appeared; and, consequently, the refraction of his rays was about nine times greater than it is in latitude 52°.

The sun and moon appear of an oval just after their rising, and before their setting: the reason is, that the refraction being greater in the horizon than at any distance above it, the lowermost limb appears more elevated than the uppermost. But, although the refraction shortens the vertical diameter, it has

no sensible effect on the horizontal diameter, which is all equally elevated. When the refraction is so small as to be imperceptible, the sun and moon appear perfectly round.

We daily observe, that the objects which appear most distinct are generally those which are nearest to us; and, consequently, when we have nothing but our imagination to assist us in estimating distances, bright objects seem nearer to us than those which are less bright and worse defined, or than the same objects do when they appear less bright, even though their distance in both cases be the same. And if, in both cases, they are seen under the same angle, our imagination naturally suggests an idea of greater distance between us and those objects which appear fainter and worse defined, than those which appear brighter under the same angles; especially if they be such objects as we were never near to, and of whose real magnitudes we can be no judges by sight.

But, it is not only in judging of the different apparent magnitudes of the same objects which are better or worse defined by their being more or less bright, that we may be deceived: for we may make a wrong conclusion even when we view them under equal degrees of brightness, and under equal angles; although they be objects whose bulks we are generally acquainted with, such as houses or trees; for proof of which the two following instances may suffice.

First, When a house is seen over a very broad river by a person standing on low ground, who sees nothing of the river, nor knows of it beforehand, the breadth of the river being hid from him, because the banks seem contiguous, he loses the idea of a distance equal to that breadth; and the house seems small, because he refers it to a less distance than it really is at. But, if he goes to a place from which the river and interjacent ground can be seen, though no farther from the house, he then perceives the house to be at a greater distance than he imagined; and therefore fancies it to be bigger than he did at first; although in both cases it appears uuder the same angle, and, consequently, makes no bigger picture on the retina of his eye, in the latter case than it did in the former.

Secondly, In foggy weather, at first sight, we generally imagine a small vessel which is just at hand, to be a large ship at a distance; because it appears so dull and ill defined, when seen through the mist, that we refer it to a much greater distance than it really is at; and therefore, under the same angle, we judge it to be much bigger. For the near object seen by the eye, appears under the same angle that the remote object does: and the rays crossing one another in the pupil of the eye, limit the size of the picture on the retina; which is the picture of the object, and if it were taken away, would be the picture of the object, only worse defined; because, being farther off it appears

Plate XXVII

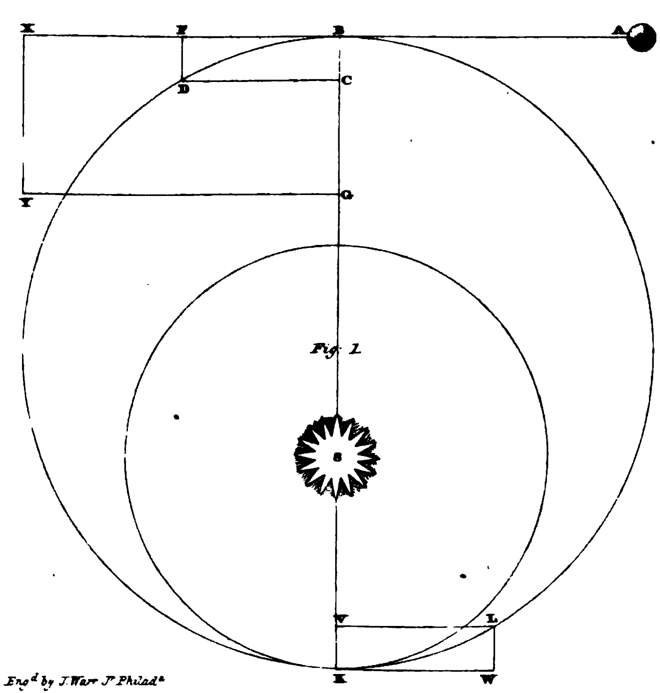


Fig. 1

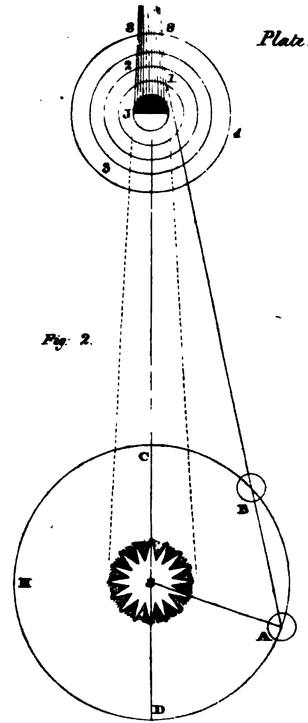


Fig. 2.

Eng.d by J. Warr Jr. Philad.a

duller and fainter. But when a fog comes between the eye and the object, the object appears dull and ill defined; which causes our imagination to refer to the greater distance instead of the small distance which it really is at.

The sun and moon appear bigger in the horizon than at any considerable height above it. These luminaries, although at great distances from the earth, appear floating, as it were, on the surface of our atmosphere, a little way beyond the clouds; of which those directly over our heads are nearer us than those in the horizon. Therefore, when the sun or moon appear in the horizon, they are not only seen in a part of the sky which is really farther from us than if they were at any considerable altitude, but they are also seen through a greater quantity of air and vapours. Here we have two concurring appearances which deceive our imagination, and cause us to refer the sun and moon to a greater distance at their rising or setting than when they are considerably high: first, their seeming to be on a part of the atmosphere which is really farther from a spectator; and, secondly, their being seen through a grosser medium, which, by rendering them dimmer, causes us to imagine them to be at a yet greater distance. And as, in both cases, they are seen much under the same angle, we naturally judge them to be biggest when they seem farthest from us; like the above-mentioned house, seen from a higher ground, which showed it to be farther off than it appeared from low ground.

Any one may satisfy himself that the moon appears under no greater angle in the horizon than on the meridian, by taking a large sheet of paper, and rolling it up in the form of a tube, of such a width, that, observing the moon through it when she rises, she may, as it were, just fill the tube; then tie a thread round it, to keep it of that size; and when the moon comes to the meridian, and appears much less to the eye, look at her again through the same tube, and she will fill it just as much, if not more, than she did at her rising.

When the full moon is in *perigee*, or at her least distance from the earth, she is seen under a larger angle, and must therefore appear bigger than when she is full at other times; and if that part of the atmosphere where she rises be more replete with vapours than usual, she appears so much the dimmer; and, therefore, we fancy her to be still bigger, by referring her to an unusually great distance; knowing that no objects which are very far distant can appear big unless they be really so.

Why an object seen under a large angle, as near objects are, appears larger than the same object would at a distance. Thus the men and women, when you meet them in the street, appear of their natural size, but if you look down upon them from the top of St. Paul's church steeple in London, they appear as

small as puppets; and thus if you look from one end towards the other of a long and straight row of trees, you will see them gradually diminish, as they are further removed from your eye, though on a near inspection you would find them all of an equal size. The reason of this can be no longer a secret. You are already informed, that rays (or rather pencils of rays) are sent forth from every visible object, in all directions, some more and some less convergent. When you are near, therefore, you see the extreme points of any object by pencils of rays, which converge or meet in an angle more obtuse than when it is at a greater distance; and as the rays cross each other in the eye, a larger image of course is painted on the retina.

An object seen by the eye at a short distance, the image on the retina is very large, but the eye placed at double the distance, the object is seen under half the angle. The image, therefore, is only half as large on the eye. This will sufficiently explain why objects *appear smaller in proportion to their distance from the eye.* Observe, however, that this proposition will admit of some exceptions, where the judgment corrects the sense. Thus, if a man six feet high (and not far distant from the spectator) is seen under the same angle with a dwarf two feet high (say at the distance of three feet from the spectator,) still the dwarf will not appear as tall as the man, because the sense is corrected by the judgment. These exceptions will, however, in general, only take place with respect to near objects, and those with whose forms we are well acquainted.

From what has been said of the structure of the eye, you will also perceive the causes of distinct and indistinct vision. To see an object distinctly, it is necessary that every pencil of diverging rays, which reaches the eye from the object, should be converged to a point on the optic nerve, corresponding to that from which the rays have diverged. If, on the contrary, they are brought in an unconverged state to the retina, you may easily conceive that the particles of light will be so scattered and dispersed, as to make an indistinct impression. This last defect takes place when the eye, by age or infirmity, is made flat, and consequently is not sufficiently convex to cause the rays to converge in their proper place; persons with this defect can often see objects better at a great distance than very near. The opposite fault to this is when the eye is too convex, when the rays will be made to unite too soon, before they reach the retina; persons with this defect, therefore, are called *short sighted*, because they can only discern objects which are very near to the eye.

From what you have already heard of the nature of lenses, you will be able to comprehend that the remedy for the former

of these defects, that is, where the eye is too flat to cause the rays to converge in the proper place, is a double convex lens, the property of which is to increase the convergency of rays. The focus of this glass, however, must be exactly adapted to the wants of the eye for which it is intended. As therefore the eye grows flatter from age and infirmities, this will explain what is meant by "spectacles for all ages;" where the defect of sight is not great, as in younger persons, spectacles not very convex will suffice; but where the eye is very flat, as in old persons, glasses of a stronger magnifying power will be required.

On the contrary, *near* sighted eyes, being too convex, it is necessary to prevent the rays from converging too soon, which can only be done by means of a concave glass, which renders convergent rays less convergent. This glass, however, must also be exactly adapted to the necessity of the eye, otherwise the rays will not converge at the proper point.

That vision is effected in this manner, may be demonstrated experimentally. Take a bullock's eye while it is fresh, and having cut off the coats from the back part, quite to the vitreous humour, put a piece of white paper over that part, and hold the eye towards any bright object, and you will see an inverted picture of the object upon the paper.

It has been a matter of inquiry among scientific persons, why the object appears in an upright position, while the image on the retina is inverted. In truth, we know nothing of the connexion which exists between the thinking faculty and the organs of sensation. It may, however, suffice to answer the present question, if we say that the mind certainly does not look upon the image which is painted on the optic nerve, That nerve is sensible of the impression from the rays of light being reflected upon it, as the organs of touch feel the impression of any external object by coming in contact with it. Nor is there any reason why the mind should not perceive as accurately the position of bodies, if the rays reflected from the upper parts of those bodies are made to touch the lower parts of the eye, as if they had been directed to the upper parts. Suffice it that such a correspondence is established between the parts of the eye to which the rays are converged, and the different parts of the object, that we do not find that persons blind from infancy, who have been restored to sight by the operation of couching, have been led into the smallest mistake as to this point.

To very perfect sight the three humours of the eye appear necessary. Yet by a very bold experiment (for such it undoubtedly was at first), it is found that we can see tolerably, well, even though one of them should be taken away, particularly if we assist the sight by glasses.—GREGORY.

On the Velocity of Light.

Let A and B (Plate XXVII. fig. 2.) be the earth in two different points of its orbit, the distance of which from each other is equal to the earth's distance from the sun S; it is then plain, that if the motion of light were instantaneous, the satellite I would appear to a spectator at A to enter into Jupiter's shadow S S, at the same moment of time, as to another spectator at B. But from a great number of observations it was found, that when the earth was at B, the emersion of the satellite into the shadow happened sooner, by about eight minutes, than when the earth was at A; and therefore the motion of light must be progressive, or such as would carry it through a space equal to the radius of the earth's annual orbit in about eight minutes of time. So that if the sun were annihilated, we should see him for eight minutes afterward; and if he were again created, it would be eight minutes before we could observe him.

The instant when any of these eclipses will happen can be easily determined by calculation, because the times in which they perform their revolutions are known; and as it is constantly found by observation, that any one of the satellites is eclipsed about sixteen minutes sooner when the earth is nearest to Jupiter, than when it is farthest from him, it is evident that this must be occasioned by the time which light takes in moving through the diameter of the earth's orbit; for that these accelerations are not owing to any inequalities in the motions of the satellites themselves, is plain, because they are always affected alike, in whatever parts of their orbits they are eclipsed.

This explication furnishes us with the solution of one of the most curious problems that ever was attempted, which is that of determining the velocity of light. The minutest particles which are thrown off from the body of the sun, move through a space of ninety-five millions of miles in eight minutes; which is about a million of times swifter than the motion of a cannon ball, when it is first projected from the mouth of the piece; a rapidity too great for the imagination to follow, or the mind to comprehend. And yet, prodigious as such a motion appears, there may be stars, whose light has not reached us since the creation of the world.—Bonnycastle.

PEPPER TRADE

ON THE

WEST COAST OF SUMATRA.

*IT is necessary to take about 600 bags, that will hold about 70 lbs. of pepper each, and sufficient boards for shifting-boards quite down to the kelson, and for bulkheads. Take with you, also, a good pair of scales and weights, and a good pair of steelyards. Horsburgh's New Directory, is also necessary, as it contains sailing directions for that coast. I have given to different persons, six manuscript copies of these directions for the Sumatra trade, and sailing directions; but as sailing directions are given in the above named work, I shall omit them here.

Turkey opium, as late as the year 1812, did not answer on the east coast of Sumatra. But it is preferred on the east end of Sumatra, and on the island of Java, to that of Bengal. Bengal opium answers best in the Straits of Malacca.

European Articles suitable on the West Coast of Sumatra.

Small Looking Glasses,	Canvas,
Muskets,	Scissors,
Pistols,	Red Cloth,
Powder,	Nails of all sizes,
Knives,	Crockery Ware,
Paper,	Iron Hoops,
Silk Handkerchiefs,	Glass Tumblers,
Gold Thread,	Dirks,
Iron Rivets,	Steel Sword Plates,
Nail Rods,	Carpenter's Tools,
Iron Pots,	Beads,

* To these instructions, selected from different masters of vessels, I have added some of my own remarks.

Padlocks,	Red Paint,
Roll Brimstone,	Yellow, do.
Brass Wire,	Black, do.
Green Paint,	Vermillion,
White, do.	Cheap Callicoes.
Blue, do.	

China Articles.

Tobacco in Baskets,	Malay Clouts,
Nankeens,	China Padlocks,
Rasps,	Coarse Bowls and Plates,
Sugar Candy,	Umbrellas.
Tea,	

Articles for the British Settlements.

Tongues,	Flour,
Hams,	Cheese,
Brandy,	Hats.
Gin,	

Bengal Articles.

First Chop Bandannoes,	Palampores,
Pulicat Handkerchiefs,	Cohoco Cloth,
Sooty Romalls,	Toocories,
Blue Sannahs, both large and small,	Humhums, fine and large,
Patna, 12 by 2, and 8 by 2,	Taffeties,
Ginghams,	Chintz Hambrush,
Gurrahs,	Dungaries.

Surat Articles.

Cotton Cheradies, 5, 6, and 7,	Chintz Molva Limbria,
Carrots,	Arabian Carpets,
Chintz Surat middlings,	Malay Handkerchiefs.
do. Guzzerat, do.	

Articles for the European Settlements, &c.

Hams,	Flour,
Tongues,	Blocks,
Gin,	Rigging,
Brandy,	Spotted Shoes,
Hats,	Shawls,
Cheese,	Middling fine broad cloths.

Measures and Weights generally used on the West Coast of Sumatra.

Most merchandize is sold by the measure on this coast. The use of weights was introduced by foreigners. The picul and cata are used only on the sea coast.

The bamboe contains nearly one gallon, wine measure. Beer measure is the standard among the Rijahs. 800 colahs make one cayaa. The coopa is one quarter of a bamboe. A cata* is 1⅓ English pounds; a picul is 100 catas, which is equal to 133⅓ English pounds. Nearly all articles, even ivory, are bought and sold by the bamboe. If ivory it is understood to be so much as is equal in weight to the bamboe of rice measure.

Measure of Length.

Topah, one fathom; *Etto*, one cubit; *Kakee*, one foot; *Jinca*, one span.

Precautions Necessary in Stowing Pepper.

Keep the pepper from damp in the ship's hold; otherwise it is liable to damage by rotting, and engendering maggots. This is inevitable if it be constantly wet, and kept from the air.

In stowing pepper in bulk, large pipes filled with water, are rolled over each layer of pepper, laying boards first till the pepper be pressed.

On the Pepper Trade at Prince of Wales' Island.

At Prince of Wales' Island, called by the Malays Poolo Penang, there is generally plenty of pepper. Of late years, they have turned their attention at that place, to the cultivation of that article, large quantities of which are also brought over from the coast of Sumatra. At Poolo Penang, the price of pepper is generally about one dollar more the picul, with the charges included, than on that coast. In 1812, pepper at Poolo Penang, stood in about five dollars the picul on board, while on the west coast of Sumatra, at the native ports it was four dollars. At the native ports a ship meets with much more delay than at Poolo Penang; still one dollar the picul on a cargo is an object. A ship of three hundred tons burthen, will carry in bulk about 5000 piculs of pepper.

Excellent voyages have been made with pepper from the

* The cata differs in weight in different places.

bright, matches lighted. Strike the bell every half hour, and sing out "All's well!" Fire morning and evening gun, and beat the drum: fire at any boat that approaches the ship after dark; and even in the day time do not permit too many boats to lay along side at a time; make them veer astern; do not permit many of the natives to come on board at one time; and make those who are admitted deliver up their creeses,* which have locked up in the arm chest, until their owners are again over the side. I searched one of the head men of a boat, who had three short creeses, wrapped up in his Malay clout, about his waist, after he had given up one which he held in his hand. This shows how careful the commander of a vessel ought to be in trading with these people. A watch must be kept here as at sea. Every thing that tends to a warlike appearance has a great effect on them. Let them see you are ready for them at any time. The more formidable you appear the more they will respect you, and the more secure and advantageous will be your trade.

It is best to be well armed when on shore, but plainly dressed, so as not to have any thing about you for the possession of which they may be induced to kill you. Go in jacket and trowsers, and take with you an old hanger, &c. It is, however, politic to betray no fear. Carry a bold front and fear no danger. In trading with them, do not expose yourselves unnecessarily: but be always on your guard. They are very jealous of their women, and at some places are offended if a stranger looks at them attentively. The men are sometimes very impertinent; but it is well to overlook their insolence. To prevent them from cheating you, you must depend on a good look out. When they are caught cheating they will laugh, and it is best for you to laugh also, as getting angry will not avail any thing with them. These precautions are highly necessary, in order to keep on good terms with them. If a person is armed, treats them kindly, has patience, shows no fear, and takes no notice of their insolence, he has nothing to fear. They seldom attack openly.

In commencing the trade with them, it is necessary first to visit the rijah and the chief men of the place, and enter into a contract with them for the pepper you want; and as they have the power to supply or refuse it, it is of the greatest consequence to pay attention and please them, and to make them small presents from time to time.

They appoint a person to see the pepper weighed and to receive the payment, with whom also it will be your interest to keep on good terms, by presents and good treatment. The

* A creese is a kind of dirk which they wear about them.

Malays weigh with an exact even beam. In weighing pepper you will find your own scales and steelyards extremely useful in greatly expediting the loading of your ship. The scales and weights ought to be brought off to the ship every night, or they will be lost. Do not lend them any of your bags, for which they will press you very much.

All pepper is weighed on shore, and carried off to the ship at the risk of the purchaser, which can be done with the ship's boats, except at Soo Soo and Munger, at which places it is necessary to employ the natives, on account of the high surf, their boats being better calculated for the purpose. At the former place the expense formerly was eight dollars for a hundred bags, equal to fifty piculs; and at the latter place eight dollars for the hundred piculs.

Many lots of pepper that will be offered for sale, will have been wetted the day before, to make it weigh heavy. The only way to detect this fraud is to put your hand into the pepper, and if it has been wet, it will feel hot. Sometimes they will put sand and dirt into the pepper, for the same purpose. By all means reject it, be the quantity ever so small, as if once received more will be offered: but if you persevere in refusing it, you will avoid much trouble, and obtain better pepper. Every bag of pepper ought to be particularly examined.

Advancing them money does not answer any good purpose; but will retard your obtaining your cargo; and if pepper is not to be had, it will be difficult to recover your money from them.

A good way to try pepper is to rub it between your hands. If it has been picked green, it will leave dirt on them; but if it leaves none, and the kernel is hard, and not much shrivelled, it was fully ripe when picked. Make them bring the pepper to the scales in their own bags, from which your men will put it into yours.

Recommend your men, when on shore, to behave discreetly, and only to attend to weighing and shipping the pepper, as great caution is necessary to avoid any difference with them.

Make the Malays come on board for their pay. It is always best to keep back about 500 dollars, till you are ready to sail.

Each of the native ports is governed by a rijah, who is absolute in his own district.

The coast of Sumatra abounds with coral rocks and shoals. A man should be kept at the mast head while coasting; and in running through narrow, difficult passages, a boat should be sent ahead of the ship, to find out the best channel. When going into a road, where you are not acquainted, send the boat in to find the best anchorage. Do not run in the night without you are well acquainted. The shoals in the day time will

show themselves to a man at the topmast head, by exhibiting a white or green appearance, time enough for you to avoid them.

SOO SOO is a native port, as before stated, in latitude 3° 36′ north, has but an indifferent roadstead, with several shoals in the bay; but most of them show themselves in a swell. There is no danger with a good look out. At this place a considerable quantity of pepper can be obtained. About 500 piculs can be shipped here in one day.

TAPANOOLY is an English settlement, in lat. 1° 40′ N. It is customary to pay fifteen per cent. here more than at native ports; but that is not an object, considering the delay you are subject to at a native port, besides the impositions and trouble in loading with your own boats; whereas they will deliver the pepper on board your ship at this place. Tapanooly is a good harbour, and has every convenience for heaving ships down. There is six fathoms water close to the shore. Five hundred piculs can be shipped here in one day. There were no charges here in 1805.

NATAL is an English settlement. Here also pepper may be had; but as the head of the house resides at Tapanooly, nothing can be done without going or sending to that place. At Natal, ships lie three miles from the shore exposed to the weather. The charges are one eighth of a dollar the picul. The purchaser pays one half the boat hire. In the year 1805, neither Ayer Bongy nor Priam had any residence.

PADANG was a flourishing Dutch settlement in 1805. It was in possession of the British. It is in latitude 0° 50′ S. While in possession of the British it was free of charges. Gold dust has been procured here in great quantities, and coffee grows wild there, which, when properly cleaned, is thought superior to that of Java. Cassia is also produced here, but of an inferior quality.

Vessels bound to the northern ports, generally stop here for refreshments, which are cheap and in great quantities. A buffalo may be obtained for five dollars, sixteen fowls for a dollar, a picul of rice for one dollar and twenty-five cents, and other things proportionably cheap. About sixty thousand weight of pepper is exported from this place anuually. It is a market for a few articles, such as iron, steel, dark ank light calicoes, white calicoes, India cottons, and pulicat handkerchiefs.

Current money at Padang are pice, fanams, rupees and Spanish dollars. Five pice, or one coping, make one fanam; twelve fanams make one rupee; and two rupees about one Spanish dollar. All articles are bought and sold here by the bamboe; twelve bamboes of rice are equal to ninety-six Dutch pounds;

and twelve bamboes of coffee are equal to seventy-eight pounds. The bamboe differs at different ports, &c.

BENCOOLEN, or *Fort Malborough*, is an English settlement. Charges at this place are very high. I do not know whether American vessels are permitted to trade there at present.

Of the Moka Trade.

There is no regular season to get coffee at Moka. New coffee never gets into market.

The caravans are so frequently robbed by the different tribes with which they are at war, and these disturbances are so general, that but small quantities of coffee can arrive safe at a time, which is stored as it gets in. When coffee is scarce, and a number of ships are there for cargoes, they have to wait for their turn to obtain them, for which ships frequently have been obliged to wait six months; but all those have obtained full cargoes. From 1804 to 1812, coffee sold at 18 dollars the picul of $133\frac{1}{3}$ English pounds; and Moka coffee sold at Smyrna, in the Mediterranean, while I was there, in 1810, for 44 cents the English pound; and at the same time West India coffee sold for 21 cents.

The business is done at Moka by an agent appointed by the government, who has the exclusive privilege of buying and selling cargoes. When it comes to your turn to load, you can bind this agent under a penalty to load you by a certain time and at a certain price, and that if there should be any pebble stones in the coffee, he will have it cleaned for you, the quality of the coffee always being the same. This agent charges $2\frac{1}{2}$ per cent. for transacting the business of ship and cargo.

The agent will try to force you to take gums, which you need not take unless you choose.

There is generally plenty of gum arabic, gum copal and saltpetre. Nothing will answer there but Spanish dollars, or imperial crowns with the impression of Maria Theresa of Germany on them. Spanish dollars vary a little sometimes in their value. They bring the coffee off to the ship in their own boats, in large baskets called canasters, containing 105 English pounds each: the boat will bring off from 60 to 100 at one time. Sugar has been taken from Batavia to Muscat, and coffee given in exchange. The coffee at Muscat is the same as that at Moka, as great quantities of coffee are taken from the neighbourhood of Moka to Muscat. Goat skins formerly were very cheap at

Moka, and were a good article to take to the United States. A small present to the agent, such as a double barrelled gun, &c. will have great influence on him. When the captain of a ship first goes on shore at Moka, he must wait on the governor, and pull off his shoes before he enters his house. Ships lay one mile from the shore at Moka.

Ships bound to Moka ought to be tolerably well armed, as the Arabs are a very piratical people.

Smyrna Price Current.

IMPORTS IN 1811.

	Piastres of 20 cents.	
Almonds, sweet, per quintal,	60	
Butter, per oke,	2½	
Cassia, do.	2¾	
Cinnamon, do.	from 6 to 8	
Cloves, do.	26	
Cochineal, do.	110	120
Coffee, West India, per 100 okes	300	350
Coffee, Moka, do.	680	720
Ginger, black, per quintal,	35	
Ginger, white, do.	50	
Gunpowder, per 100 lbs.		
Hardware, per 100 dozen,		
Indigo, Carolina, per oke,	20	25
Indigo, Spanish, do.	25	40
Indigo, East India, do.	30	33
Jalap, per oke,	7	
Iron, Russia, per quintal,	17½	18½
Iron, Swedish, do.	22	
Iron, plates, do.	35	
Lead, English, do.	50	
Lead, Spanish, do.		
Lead, shot, per English cwt.	65	
Londras Blue, per pike of 27 inches,	4	
Londrins Cloths, do.		
Mahoots, do.	17	
Muslins, East India, per piece,		
Nails, Dutch, per quintal,	60	
Nankins, per piece,		
Nutmegs, per oke,	60	65
Pepper, do.	2¾	
Rhubarb, do.	7	12
Rice, Egyptian, per killo. of 10 okes	5	

	Piastres. from	to
Rice, Carolina, do.	5	
Rum per gallon,	6½	7
Sarsaparilla, per oke,	8	12
Seersuckers, per piece,	100	150
Salloons, do.	60	80
Shallee Cloths, per pike of 27 inches,		
Sugar, Havanna, white, per quintal,	70	80
Sugar, Brown, do.	50	
Sugar, East India, do.	40	
Sugar, Muscovado, do.	60	
Sugar, refined, in small loaves, do.	106	
Sugar, refined, in large loaves, do.	110	
Steel German, do.	65	70
Spelter, per oke,	2	
Tallow,		
Tin, in bars, per quintal,	200	207
Tin, plates, per double box of 225 leaves each, per quintal,	165	170
Tobacco, in carots, per carot,		
Vitriol, per quintal,	15	18
Wood, Brazil, Pernambuco, per quintal,	120	
Logwood, do.	15	18
Nicarraga, or Santa Martha, do.	35	50

A number of the above articles come out of the Black Sea from the Russian dominions, such as tallow, buffalo, butter, iron, besides cordage, hemp, sail cloth. Cordage sold at Smyrna in 1811, for 7 dollars per quintal of 125 pounds; Russia duck for 8 dollars the bolt, but not of so good quality as imported from the Baltic.

I have been informed that the inhabitants of Smyrna do not now make quite that difference in price between West India and Moka coffee, that they did formerly, the Turks having been long in the habit of receiving coffee by the caravans from Moka, before the West India coffee was introduced there. This, of course, occasioned considerable prejudice in favour of Moka coffee, which time alone could subdue, but they may now have become more accustomed to West India.

Prices of Exports from Smyrna in 1811.

	Piastres.
Boxwood per quintal,	8¼
Carpets per pike, 27 inches,	5
Coculus Indicus, per oke,	2
Copper, do.	2½
Cotton wool kirkagatch, per quintal,	86
Cassabed, do.	87

	Piastres.	
Soubagia, first quality, per quintal,	95	
Second quality, do.	90	
Cotton yarn, white, per oke,	3½	
Red, per oke,	From 6 to 72	
Emery stones, per quintal,	2	
Figs, do.		
Galls, black, do.	130	
Green, do.	100	
White, do.	75	
Goat's hair, per oke,		
Goat's skins, per skin,		
Goat's wool, black, per chequee of 2 okes,	18	
do. second quality, do.	14	
Gray, do.	9	
Red, do.	11	
Gum ammoniac, per oke,	4	6
Arabic, gum, per quintal,	135	150
Assafœtida, per oke,	3	6
Mastic per case of 70 okes,	550	
Myrrh, per oke,	6	9
Tragacanth, do.	7½	7½
Hare skins, per 100 skins,		
Madder roots, per quintal,	30	33
Mohair yarn, per oke,	4	14
Opium per chequee of 250 drams,	24	25
Oil, per quintal,	40	
Raisins, black, do.	8	
red, do.		
Sultana, do.		
Safflour, do.	60	
Scammony, per oke,	28	60
Sal ammoniac, do.	4½	
Salep, do.	3½	
Senna, do.	5½	
Sheep's wool, per quintal,	32	
Silk Brussa, per taffee of 610 drams,	80	
Sponge, per oke,	9	12
Valonea, per quintal,	5½	7½
Wax, yellow, do.	200	
Wheat, per killow of 22½ okes,	7	
Yellow berries,	1½	3½

180 drams is one rotolo, or 1¼ pound, one hundred of which make one quintal of 125 pounds.

One oke is 2¾ pounds, 45 of which is one quintal.

Cotton wool and tin is sold by the quintal of 44 okes; all other goods are sold by the quintal of 45.

A piastre at Smyrna is 20 cents; a piastre at Marseilles, is one Spanish dollar, &c.

Exchanges at Smyrna.

Amsterdam per florin, current, 31 days sight,	81	
Constantinople agio on bills, 11 days sight,	3	per cent.
Leghorn piastre of 8 reals, 31 day sight,	5	
London per pound sterling, 31 days sight	20	drawers ask 21.
Marseilles per piastre of 8 reals, do.	24	

Opium at Smyrna in 1811, was 2 dollars 74 cents the pound, and after being put in tin cases of one picul each, and those put into wooden boxes and put on board, including all charges, cost 433 dollars the picul. The price of opium at Canton is very fluctuating, from 600 to 1000 dollars the picul. Bengal opium formerly was much preferred, and the difference of price between the Turkey and Bengal opium was considerable. But of late the Turkey opium is in nearly as great estimation as that of Bengal.

The importation of opium into China, is prohibited by the emperor, but is connived at by the Mandarins, who receive 10 dollars per picul as gratification money, for allowing it to be bought and sold there.

In the year 1811, a double duty* at Smyrna was exacted on cargoes in vessels under American colours; but those American vessels trading to Smyrna at that time, saved six per cent. by hoisting British colours, and claiming the protection of the British consul at that place. Since that time I have been unacquainted with the affairs of that place, not having been there since 1811.

Articles suitable for the Isle of France, Bourbon and Batavia Markets, &c.

Bordeaux Wine, in casks, cases, and bottles,	Flour in barrels,
Madeira Wine,	Sweet Oil,
Champaigne Wine in bottles,	Macaronis,
Wine de Grave,	Beef,
Brandy,	Pork,
Jamaica Rum,	Lard,
Holland Gin,	Cheese,
American Gin,	Hams,
Vermicelli,	Wax Candles,
	Spermaceti do.

* This double duty was exacted at Constantinople also.

Tallow candles,
Cordage from 1 to 4 inches, (it must be good.)
Russia Duck,
Ravens do.
Tar,
Turpentine,
Varnish,
Twine of three threads,
Salmon in barrels,
Mackarel do.
Herrings,
Codfish,
Pickled tongues,
French and Castile Soap,
American White Soap,
Richmond Tobacco,
White Lead,
Red do.
Red Paint,
Yellow, do.
Black do.
Green do.
Linseed Oil,
Pump Leather,
Pump Tacks,
Nails, assorted.

At the above places the markets are very fluctuating. At present, American vessels are prohibited from entering at the Isle of France; it is now in possession of the British. The Island of Bourbon is in possession of the French; Batavia is in possession of the Dutch; and American vessels are permitted to trade there, (1821.)

Remarks on taking in Salt.

Mayo is a small island, not more than 17 miles in circumference, entirely devoid of verdure, and presenting nothing to the eye but a mass of brown and barren rocks. It is subject to the Portuguese government, as well as the rest of the Cape Verde Islands, and inhabited by blacks, who reside here only on account of the salt, which is produced by the operation of the sun's rays on the salt water. This salt water flows over a beach into a large pond, only three days in each year, and only in the month of March, at the time of the equinox, at the change or full of the moon. At the equinox in September, the water does not rise sufficiently high to flow over this beach; the reason is, that the earth is nearer the sun in our winter than it is in summer, and of course is nearer in March than in September; for which reason the attractive power of the sun is greater when he is nearer the earth. [See Nature of the Tides, page 100, on the effects of the disturbing forces of the sun and moon.]

When all the water has evaporated, a crust of salt is left, which, before it is broken, appears like glass. This salt is taken to the landing place, about two miles from the pond, on asses, where it is deposited in heaps as large as houses. This salt is common to all the inhabitants of that place, though those who

are best able to bear the expense of its carriage to the landing place, of course possess the greatest share of it. It is sold to foreigners at five dollars the moy of sixty bushels. The purchaser has also to pay a duty of one dollar and twelve cents on each moy. This price is settled by the Portuguese government; and no person is permitted to sell for more or less than five dollars the moy, on pain of transportation to the coast of Africa. The number of men employed in loading a vessel there, will make the salt, when on board, amount to from fifteen to sixteen cents the bushel. A bushel of the Isle of Mayo salt will weigh from seventy-six to seventy-eight pounds. The duties in the United States being twenty cents on the fifty-six pounds, will be about twenty-eight cents, so that in all it will stand, in the United States, at about forty-five cents the bushel. In the bad weather season a great quantity of salt is lost by its getting wet. This bad weather season is from July to December. The manner of striking the salt at Mayo is with a sharp striker, which tends rather to scoop the salt out of the tub: on the contrary, in the United States, the striker is round, which presses the salt into the half bushel. These two differences no doubt occasion considerable loss to the buyer at Mayo; so that it will be well for those bound there for salt, to take with them a round striker already coppered, long enough to go across a half barrel, and a sufficient number of iron shovels. It is best to take good strong bagging, and the bags can be made on the passage; to be sewed strong, not too wide, because they lose in the tying; made to hold one bushel. The bags, after the cargo is on board, can be sold to the inhabitants. If you hire bags you will have to pay high for them. Take with you also a kedge anchor, as it will be wanted to lay off a traveller to lower the salt by. The inhabitants at that place can show any person unacquainted how to rig the traveller, &c. Vessels load with their own boats, so that it is also necessary to have a good strong long boat.

In the bad weather season, which is the worst in August and September, the wind sometimes blows very heavily from the south; and frequently in those gales vessels have been obliged to slip and put to sea. These tremendous gales are called southers. I was there in the ship Recovery, of Philadelphia, in 1815, in the month of August, when the weather was so bad and the sea dashed so hard against the rocks, that I was detained two days from taking off salt. I have been informed that in the good weather season the water there is quite smooth.

The dunnage which is procured here is a kind of heath, which is scarce and dear, so that it is best to provide that article beforehand.

When salt is scarce, vessels have sometimes to wait for their turn.

The inhabitants of this island depend for subsistence on the Island of St. Jago, which is only fifteen miles from Mayo.

On purchasing Molasses in the West Indies.

The person who buys molasses in the West Indies to sell in the United States, lays under many disadvantages. In the first place it is a general custom to take the hogsheads from those persons who sell the molasses, which they have made by their own workmen or slaves, who take good care to have the bung diameter perhaps two or three inches greater than the cross diameter. By this means from five to ten per cent. is lost on the cask alone when guaged in the United States; besides the loss which always takes place between the rod and Gunter, which is five per cent. The molasses is also gauged when laying in the sun, or just as it is pumped out of the tank, when it is in a state of fermentation, which also occasions a loss. An allowance is made for this, but not quite sufficient. Another disadvantage is when taking the outs with the rod: they will jerk it up and down in the cask, which raises the molasses at least two inches, so that when the out is six inches they make it but four; and in proportion to the out, the loss will be more or less. Every advantage will be taken, particularly when molasses is in great demand, and in such case the purchaser must submit to those impositions or go without it. Therefore, in that case, it must be considered in the price of the molasses. But when molasses is plenty, and but little demand for it, these impositions for the most part may be avoided. I have dealt with some very just men in the West Indies, who would not take any advantage whatever.

The molasses which comes out of the tank will not be so good as that which comes from the plantations in hogsheads or kegs. The acid which is created in the bottom and round the walls of the tank, turn good molasses sour; and in general old molasses is mixed with the good. A person who purchases molasses in the West Indies, must be cautious when tasting it, as the sellers will try to vitiate his palate by first taking him to a cask of sour molasses. It is only the molasses which runs from the clayed sugar that turns sour, as there is an acid in the clay; and the fresh water which the clay is mixed with also tends to sour the molasses.

The molasses which runs or drains from the muscovado sugar, does not turn sour.

The manner in which a cargo of molasses is stowed being generally known, I shall omit mentioning it here. One thing must be remarked—when molasses is put between decks the hogsheads must be stowed athwart-ships, or else the motion of the vessel will slew them bung downwards, and thereby expose the molasses to run out of the bungs and vent holes. It is not safe to have more than three heights of hogsheads of molasses in the lower hold, as otherwise the lower tier may suffer by the weight of the upper casks, barrels, and tierces, making the fourth. Very deep ships have three decks.

The molasses sellers in the West Indies will tell you the reason they make the casks in that oval shape noticed above is, that they can support weight better; but the casks which are made in Philadelphia are perfectly round, and support weight equally the same; so that this is only an excuse. Attention must be paid that the molasses casks be made of red oak staves, and the heads of pine boards. The boards in the head must be up and down; if not it will not support much weight, and will most assuredly be broke, and occasion the loss of the molasses. Casks otherwise made must by all means be rejected.

All vessels bound to Hamburg must report their cargoes at Stade,* where a small duty is exacted. If they have tobacco on board, to avoid an over charge, it is necessary that the bills of lading particularly express leaf tobacco, and the number of hogsheads, but not the weight. With teas the weight must be mentioned. Nankeens should be reported by the web; as in this case ten pieces will pay no more than otherwise one piece would.

The masters of vessels bound to Marseilles should be very particular in manifesting their cargoes, and even the least article of the cabin stores; for if there should be a difference even of one pound of sugar or tea, 200 francs for each package so differing from the manifest, either over or under, will be exacted.

In Marseilles they are very rigid in the quarantine laws; and

* Stade is a small village in Hanover, in the river, a little distance below Hamburgh. You report by the bills of lading; and if the cargo should not agree with the bills of lading when discharged at Hamburg, some difficulty will take place with the custom house, and a fine will be exacted according to the difference in the accounts.

It is a rule for the master of a vessel to make a small present to the officers when he reports, as ten or twelve pounds of coffee, fifteen or twenty pounds of sugar, &c. This sometimes prevents much difficulty.

I am informed that if a cargo should be insured at Lloyd's in London, and the master of the vessel in which it is shipped take a Heligoland pilot, after arriving safe at Hamburg, the pilotage, if reasonable, will be returned.

if the master of a vessel arriving there, should conceal any thing relative to the health of the persons on board, or should not give correct answers to every question asked by the quarantine officer, and the same should be afterwards discovered, he will be liable to a very heavy penalty; as Marseilles suffered most dreadfully by the plague in 1720. Out of 120,000 inhabitants of that place, 80,000 were carried off by that distemper. It was introduced by a vessel from Constantinople. And this it is supposed has caused the health officers to be so extremely rigid.

Vessels bound to Canton, when arriving at Macoa, should enter cargo. If there should be no cargo on board, and the question should be asked, report wine or other liquors; and when the vessel arrives at Canton, the deception can be managed by sending up a few casks of water reported as wine. Some vessels have been detained for two and three weeks at Macoa, in consequence of not entering cargo, If cargo is not reported, no pilot will be permitted to go on board.

A ship while lying to off Macoa should be on her guard, for fear of pirates, and keep watch the same as at sea. The pilots of Canton river should not be trusted to run at night. They scarcely ever run at night without running the ship on shore, even the best of them.

English Measures of Length.

Inches.											
3	Palms.										
9	3	Spans.									
12	4	1⅓	Feet.								
18	6	2	1½	Cubits.							
36	12	4	3	2	Yards.						
60	20	6⅔	5	3⅓	1⅔	Paces.					
72	24	8	6	4	2	1⅕	Fath.				
198	66	22	16½	11	5½	4 3/10	2¾	Poles.			
7920	2640	880	660	440	220	132	110	40	Furl.		
63360	21120	7040	5280	3520	1760	1056	880	20	8	Mile.	

Also, 4 inches = 1 hand; 3 miles = 1 league; and 60 geographical miles = 1 degree = 69.2 English miles.

A Table of the Measures of Length of the principal Places in Europe compared with the American Yard.

100	aunes or ells of England,	equal 125
100	of Holland or Amsterdam, Haerlem, Leyden, the Hague, Rotterdam, Nuremburg, and other cities of Holland,	75
100	of Brabant or Antwerp.	76
100	of France and Osnaburgh,	128½
100	of Hamburg, Frankfort, Leipsic, Bern and Basil,	62½
100	of Breslau,	60
100	of Dantzic,	65¾
100	of Bergen and Drontheim,	68¼
100	of Sweden and Stockholm,	65¾
100	of St. Gall, for linens,	87½
100	of do. for cloths,	67
100	of Geneva,	124¾
100	canes of Marseilles and Montpelier,	214½
100	of Thoulouse and High Languedoc,	200
100	of Genoa, 9 palms,	245¼
100	of Rome,	227¼
100	varas of Spain,	93¾
100	of Portugal,	123
100	cavidos of Portugal,	75
100	brasses of Venice,	73½
100	of Bergamo,	71¼
100	of Florence and Leghorn,	64
100	of Milan,	58½

A Comparison of the American Foot with the Feet of other Countries.

The American foot being divided into 1000 parts, or into 12 inches, the feet of several other countries will be as follow.

	Parts.	Inch.	lin.	points.
America,	1000	12	0	0
London,	1000	12	0	0
Antwerp,	946	11	4	1.32
Bologna,	1204	14	5	2.25
Bremen,	964	11	6	4.89
Cologne,	954	11	5	2.25
Copenhagen,	965	11	6	5.76
Amsterdam,	942	11	3	3.88
Dantzick,	944	11	3	5.61
Dort,	1184	14	2	2.97
Frankfort on the Main,	948	11	4	3.07

	Parts.	Inch.	lin.	points
The Greek,	1007	12	1	0.04
Lorrain,	958	11	5	5.71
Mantua,	1569	18	9	5.61
Mecklin,	919	11	0	2.01
Middleburg,	991	11	10	4.22
France,	938	11	3	0.42
Prague,	1026	12	3	4.46
Rhyneland or Leyden,	1033	12	4	4.51
Riga,	1831	21	11	3.98
Roman,	967	11	7	1.48
Old Roman,	970	11	8	0
Scotch,	1005	12	0	4.32
Strasburgh,	920	11	0	2.88
Toledo,	899	10	9	2.73
Turin,	1062	12	8	5.66
Venice,	1162	13	11	1.96

A Table representing the Conformity of the Weights of the principal trading Cities of Europe with those of America.

Pounds.		of America.	
100 of England, Scotland, and Ireland,	Equal	100*lb.*	0*oz.*
100 of Amsterdam, Paris, Bordeaux, &c.		109	8
100 of Antwerp, or Brabant,		103	12
100 of Rouen, the Viscounty,		113	14
100 of Lyons, the city,		94	3
100 of Rochelle,		110	9
100 of Toulouse, and upper Languedoc,		92	6
100 of Marseilles and Provence,		88	11
100 of Geneva,		123	
100 of Hamburg,		107	5
100 of Frankfort,		111	11
100 of Leipsic,		104	5

A Table representing the conformity of the Weights of the Principal Trading Cities of Europe with those of America.

Pounds.	*lbs.*	*oz.*
100 of Genoa,		73
100 of Leghorn,	75	8
100 of Milan,	65	3
100 of Venice,	65	11
100 of Naples,	64	10
100 of Seville, Cadiz, &c.	103	7
100 of Portugal,	95	4
100 of Liege,	104	
100 of Spain,	97	
Note.—The Spanish Arrobe is 25 Span. lbs.	25	12 6*dr.*

Apothecaries' Weight.

20 Grains	make one	Scruple, *marked*	℈
3 Scruples	make one	Drachm.	ʒ
8 Drachms	make one	Ounce.	℥
12 Ounces	make one	Pound.	℔

20 Grains	1 Scruple.			
60 =	3 =	1 Drachm.		
480 =	24 =	8 =	1 Ounce.	
5760 =	288 =	96 =	12 =	1 Pound.

Troy Weight.

24 Grains	make one	Pennyweight, *marked*	pwt.
20 Pennyweights	make one	Ounce,	oz.
12 Ounces	make one	Pound,	℔ or lb.

Grains 24 =	1 Pennyweight.		
480 =	20 =	1 Ounce.	
5760 =	240 =	12 =	1 Pound.

*Avoirdupois Weight.**

16 Drachms	make one	Ounce,	*marked* oz.
16 Ounces	make one	Pound,	lb.
28 Pounds	make one	Quarter of a hundred weight.	qr.
4 Quarters	make one	Hundred wt. or 112 pounds,	Cwt.
20 hund. wt	make one	Ton.	T.

* By this weight are weighed gold, silver, jewels, electuaries, and all liquors.

An ounce of gold is divided into 24 parts, called carats, and an ounce of silver, into 20 parts, called pennyweights; therefore to distinguish fineness of metal, such gold as will abide the fire without loss, is accounted 24 carats fine: if it lose 2 carats in trial, it is called 22 carats fine, &c.

A pound of silver, which loses nothing in trial, is 12 ounces fine: but if it lose 3 pennyweights, it is 11 oz. 17 pwts. fine, &c.

Alloy, is some base metal with which gold or silver is mixed, to abate its fineness. Twenty-two carats of gold, and 2 carats of copper are esteemed the true standard for gold coin in England, the alloy being one eleventh of the fine gold: and 11 oz. 2 pwts. of fine silver, melted with 18 pwts. of copper, make the true standard for silver coin.

Note—175 Troy ounces are precisely equal to 192 Avoirdupois ounces, and 175 Troy pounds are equal to 144 Avoirdupois. 1 lb. Troy=5760 grains, and 1 lb. Avoirdupois=7000 grains.

By Avoirdupois are weighed all coarse and drossy goods, grocery and chandelry wares, bread and all metals, except gold and silver.

A barrel of pork weighs 220 lbs.; a barrel of beef, 220 lbs.; a quintal of fish, 1 cwt. avoirdupois; 12 particular things make one dozen; 12 dozen one gross, 144 dozen one great gross; 20 particular things make a score.

Table of the Value of several Pieces of Coin in the United States.

	Federal Coin.				Federal Coin.
	Cents.				Cents.
$\frac{1}{16}$ of a Dollar,	0,06$\frac{1}{4}$	Eng. or Fr. Crown,			1,11 $\frac{1}{9}$
$\frac{1}{2}$ a Pistareen,	0,10		pwt.	gr.	
		Fr. Guinea,	5	5	4,62$\frac{26}{27}$
$\frac{1}{9}$ of a Dollar,	0,11$\frac{1}{9}$	In Mass.	5	6	4,55$\frac{1}{9}$
$\frac{1}{8}$ of ditto,	0,12$\frac{1}{2}$	Eng. Guinea,	5	6	4,66$\frac{2}{3}$
A Pistareen,	0,20	In S. Carolina,	5	7	
		$\frac{1}{2}$ Johannes,	9	0	8,00
An English shilling,	0,22$\frac{2}{9}$	Pistole,	4	5	3,66$\frac{2}{3}$
$\frac{1}{4}$ of a Dollar,	0,25	In Mass.	4	3	
Half ditto,	0,50	Moidore,	6	18	6,00
A Dollar,	1,00	Doubloon,	17	0	14,66$\frac{2}{3}$

The standard weight of an Eagle 11 *pwt.* 4$\frac{2}{3}$ *gr.*—Half ditto, 5 *pwt.* 14$\frac{1}{3}$ *gr.*—A Dollar 17 *pwt.* 1$\frac{3}{4}$ *gr.*—Half ditto, 8 *pwt.* 12$\frac{7}{8}$ *gr.*—A double Dime 3 *pwt.* 9$\frac{4}{5}$ *gr.*—A Dime 1 *pwt.* 16$\frac{9}{10}$ *gr.*

Table of Refiners' Weight.

Blanks.			
24 =	1 Perrot.		
480 =	20 =	1 Mite.	
9600 =	400 =	20 =	1 Grain.

Note.—What they denominate a carat, is the $\frac{1}{24}$ of a pound, an ounce or any other weight.

Dutch Weights for Gold and Silver.

32 aces = 1 engel, 20 engels = 1 ounce, 8 ounces = 1 mark, for gross gold.—Also, 24 parts = 1 grain, 12 grains = 1 carat, 24 carats = 1 mark, for fine gold.

The mark weights are 1 per cent. lighter than our Troy weight.

The Length of Miles, Leagues, &c. Ancient and Modern, in American Yards.

Ancient Roman mile, - - -	1610,348
Olympic stadium = $\frac{1}{8}$ of ancient Roman mile -	201,2935
Stadium = $\frac{1}{10}$ of ancient Roman mile, - -	161,0348
Stadium = to the 1100th part of a degree, -	111,2
Jewish resin, of which 7$\frac{1}{2}$ = ancient Roman mile	212,713

Gallic leuca=1½ ancient Roman mile, - - -	2415,522
German rast, or common league in France,=2 Gallic leuca, - - - - - -	4831,044
Persian parasang=2 Gallic leagues, - -	4831,044
Egyptian schæne=4 ancient Roman miles -	6441,392
German league, or that of Scandinavia,=2 rasts,	9662,088
The mile or league of Germany=200 Rhenish yards,	8239,846
Great Arabian mile, used in Palestine in the time of the Crusades, rated at 1½ ancient Roman mile	2415,713
Modern Roman mile, - - - -	1628,466
Modern Greek mile of 7 Olympic stadia, -	1409,0545
Modern French league = 2500 toises, - -	5328,75
Mile of Turkey, and the common werst of Russia, supposing it 7 Olympic stadia,	1409,0515
League of Spain = 4 ancient Roman miles, -	6441,392
Large league of Spain = 5 do. - -	8051,74

The mile employed by the Romans in Great Britain, and restored by Henry VII. was our present English mile.

The ancient Roman mile is here estimated at 755 French fathom, 3 feet, upon the authority of D'Anville. This differs a little from the mile used in the preceding table.

The Length of Long Measures of various Countries in terms of American Feet and Inches.

		Feet.	Inches.
Ancient Roman	Foot, - -	0	11,626
Greek,	do. - - -	1	0,090
Arabic,	do. - -	0	10,544
Alexandria,	do. - - -	1	2,112
Paris,	do. - -	1	0,789
Rynland or	Leyden, - - -	1	0,361
Amsterdam,	do. - -	0	11,303
Antwerp,	do. - - -	0	11,352
Dort,	do. - -	1	2,204
Bologne,	do. - - -	1	2,974
Turin,	do. - -	1	8,222
Venice,	do. - - -	1	1,677
Padua,	do. - -	1	4,866
Vienna,	do. - - -	1	0,444
Sweden,	do. - -	1	2,701
Lorrain,	do. - - -	0	11,496
Middleburgh,	do. - -	0	11,892
Strasburgh,	do. - - -	0	11,040
Bremen,	do. - -	0	11,568
Cologne,	do. - - -	0	11,448
Frankfort and Mænum,	do. - -	0	11,376

		Feet.	Inches.
Spanish,	Foot,	1	0,012
Toledo,	do.	0	10,788
Bononia,	do.	1	2,448
Mantua,	do.	1	6,838
Dantzic,	do.	0	11,328
Copenhagen,	do.	0	11,580
Riga,	do.	1	9,972
Prague,	do.	1	0,312
Lyons,	Ell.	3	11,604
Bologna,	do.	2	0,912
Amsterdam,	do.	2	3,228
Antwerp,	do.	2	3,276
Rynland or Leyden	do.	2	3,120
Frankfort,	do.	1	9,912
Hamburgh,	do.	1	10,860
Leipsic,	do.	2	3,120
Lubeck,	do.	1	10,896
Noremburgh,	do.	2	2,724
Bavaria,	do.	0	11,448
Vienna,	do.	1	0,636
Bononia,	do.	2	1,764
Dantzic,	do.	1	10,836
Florence brace, or ell,		1	10,956
Spanish	Palm,	0	9,012
Genoa,	do.	0	9,960
Naples,	do.	0	10,316
Modern Roman,	do.	0	8,798
Spanish	Vare,	-	0,040
Lisbon,	do.	2	9,000
Gibraltar,	do.	2	9,120
Toledo,	do.	2	8,220
Castile,	do.	2	8,949
Naples,	Brace,	2	1,200
Naples,	Canna,	6	10,560
Milan,	Calamus,	6	6,528
Flor. Braccio da Panna,		1	10,954
Russia,	Archine,	2	4,242
Rome Palmodi Arcteti,		0	8,784
Parma,	Cubit,	1	10,392
China,	do.	1	0,192
Cairo,	do.	1	9,888
Old Babylonian,	do.	1	6,240
Turkish Pike larger,		2	2,400
Turkish Pike smaller,		2	1,572
Persian	Arish,	3	2,364

Enumeration.

To enumerate any parcel of figures, observe the following rule.

First, commit the words at the head of the table, viz. units, tens, hundreds, &c. to memory; then, to the simple value of each figure, join the name of the place, beginning at the left hand, and reading towards the right.—*More particularly*.—1. Place a dot under the right hand figure of the 2d, 4th, 6th, 8th, &c. half periods, and the figure over such dot will, universally, have the name of thousands.—2. Place the figures 1, 2, 3, 4, &c. as indices, over the 2d, 3d, 4th, &c. period; These indices will then shew the number of times the millions are involved—the figure under 1, bearing the name of millions, that under 2, the name of billions (or millions of millions,) that under 3, trillions, (or millions of millions of millions.)

EXAMPLE.

Sextill.	Quintill.	Quatrill.	Trillions	Billions	Millions	Units.
th. un.	th. un.	th. un.	th. un.	th. un.	th. un.	c.x.t. c.x.u.
6	5	4	3	2	1	
913,208;	000,341;	620,057;	219,356;	809,379;	120,406;	129, 763
Thousands	Thousands	Thousands	Thousands	Thousands	Thousands	Thousands

Note 1.—Billions is substituted for millions of millions—Trillions, for millions of millions of millions—Quatrillions, for millions of millions of millions of millions.

Quintillions, Sextillions, Septillions, Octillions, Nonillions, Decillions, Undecillions, Duodecillions, &c. answer to millions so often involved as their indices respectively denote.

Note 2.—The right hand figure of each half period has the place of units of that half period; the middle one, that of tens, and the left hand one, that of hundreds.

THE APPLICATION.

Write down, in proper figures, the following numbers.

Fifteen.

Two hundred and seventy-nine.

Three thousand, four hundred and three.

Thirty-seven thousand, five hundred and sixty-seven.

Four hundred, one thousand and twenty-eight.
Nine millions, seventy-two thousand and two hundred.
Fifty-five millions, three hundred, nine thousand and nine.
Eight hundred millions, forty-four thousand, and fifty-five.
Two thousand, five hundred and forty-three millions, four hundred and thirty-one thousand, seven hundred and two.

Write down, in words at length, the following numbers.

8	437	709040	3476194	7584397647
17	3010	879066	84094007	49163189186
129	76506	4091875	690748591	500098400700

Notation by Roman Letters.

I. One.	XV. Fifteen.	CC. Two hundred.
II. Two.	XVI. Sixteen.	CCC. Three hundred.
III. Three.	XVII. Seventeen.	CCCC. Four hundred.
IV. Four.	XVIII. Eighteen.	D or Iↄ. Five hundred.
V. Five.	XIX. Nineteen.	DC. Six hundred.
VI. Six.	XX. Twenty.	DCC. Seven hundred.
VII. Seven.	XXX. Thirty.	DCCC. Eight hundred.
VIII. Eight.	XL. Forty.	DCCCC Nine hundred.
IX. Nine.	L. Fifty.	M or CIↄ. One thousand.
X. Ten.	LX. Sixty.	Iↄↄ. Five thousand.
XI. Eleven.	LXX. Seventy.	Iↄↄↄ. Fifty thousand.
XII. Twelve.	LXXX. Eighty.	IↄↄↄIↄↄↄ. Five hundred thousand.
XIII. Thirteen.	XC. Ninety.	
XIV. Fourteen.	C. Hundred.	MDCCLXXXVIII. One thousand seven hundred and eighty-eight.

A less literal number, placed after a greater, always augments the value of the greater; if put before, it diminishes it. Thus, VI is 6; IV is 4. XI is 11; IX is 9, &c.

AN ACCURATE DETAIL

OF THE

DUTIES PAYABLE ON ALL GOODS, WARES AND MERCHANDISE,

Imported into the United States after the last day of June, 1816.

ARTICLES.	Ad valorem or specific.	Imported in Am. ves.	Imported in For. ves.
A			
Ale, beer and porter, in bottles,	Per gallon	15 cents.	16½ cts.
imported otherwise than in bottles,		10	11
Almonds,	lb.	3	$3\frac{3}{10}$
Allum,	per cwt.	100	110
Arms, fire and side,	per cent. ad val.	20	22
Artificial Flowers,	ditto.	30	33
Anchors,	cwt.	150	165
Articles composed wholly or chiefly of gold, silver, pearls and precious stones, laces, laced veils, laced shawls, or shades of thread or silk,	per cent. ad val.	7½	8¼
B			
Brass Wire,	per cent. ad val.	20	22
Bristles,	per lb.	3	$3\frac{3}{10}$
Bottles, black qt. glass,	per groce.	144	$158\frac{2}{5}$
Boots,	per pair,	150	165
Books blank, and parchment,	per cent. ad val.	30	33
printed, not being free by law,	per cent. ad val.	15	16½
Bonnets, hats and caps,	ditto,	30	33
Buttons and button moulds and buckles,	ditto,	20	22

ARTICLES.	Ad valorem or specific.	Imported in Am. ves.	Imported in For. ves.
C			
Cables and tarred cordage,	per lb.	3	$3\frac{3}{10}$
Cannon, muskets, fire and side arms,	per ct. ad val.	20	22
Cabinet wares, and manufactures of wood,	ditto,	30	33
Canes, whips and walking sticks,	ditto,	30	33
Candles of tallow,	per lb.	3	$3\frac{3}{10}$
of wax or spermaceti,	ditto,	6	$6\frac{3}{5}$
Caps, bonnets and hats,	per ct. ad val.	30	33
Cheese,	per lb.	9	$9\frac{9}{10}$
Cassia, Chinese,	ditto,	6	$6\frac{3}{5}$
Composition bolts, rods, spikes, rods and nails,	ditto,	4	$4\frac{2}{5}$
Cinnamon and cloves,	per lb.	25	$27\frac{1}{2}$
Coal, heaped,	per bushel,	5	$5\frac{1}{2}$
Cocoa,	per lb.	2	$2\frac{1}{5}$
Coffee,	per lb.	5	$5\frac{1}{2}$
Cotton,	per lb.	3	$3\frac{3}{10}$
Copperas,	per cwt.	100	110
Chocolate,	per lb.	3	$3\frac{3}{10}$
Clothing ready made,	per ct. ad val.	30	33
Carriages, or parts thereof,	per ct. ad val.	30	33
China, earthen and stone ware,	per ct. ad val.	20	22
Currants,	per lb.	3	$3\frac{3}{10}$
Cutlery,	per ct. ad val.	20 p. c.	22 p. c.
Cordage, untarred yarns, twine-packed thread and seine,	per lb.	4	$4\frac{2}{5}$
Cosmetics, washes, balsams and perfumes,	per ct. ad val.	30	33
D			
Duck, Russia, not exceeding 52 archeens a piece,	per piece,	200	220
Duck, Holland, not exceeding 52 archeens a piece,	per piece,	250	275
Duck, ravens, not exceeding 52 archeens a piece,	per piece,	125	$137\frac{1}{2}$
Drugs, dying and materials for composing dyes, not subject to other rates of duty,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$

ARTICLES.	Ad valorem or Specific.	Imported in Am. ves.	Imported in For. ves.
E			
Earthen and stone ware,	per ct. ad val.	20	22
Embroidery and epaulets,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
F			
Fans and feathers,	per ct. ad val.	30	33
Figs,	per lb.	3	$3\frac{3}{10}$
Fish foreign caught, dryed,	per quintal,	100	110
Mackarel,	per bbl.	150	165
Salmon,	per bbl.	200	220
All other pickled,	per bbl.	100	110
Floor cloths painted, matts of grass, or flags,	per ct. ad val.	30	38
G			
Glass, window, not above 8 by 10,	per 100 sq. ft.	250	275
not above 10 by 12,	per 100 sq. ft.	275	$302\frac{1}{2}$
above 10 by 12,	per 100 sq. ft.	325	$357\frac{1}{2}$
Black quart bottles,	per groce,	144	$158\frac{2}{5}$
Manufactures other than the above,	per ct. ad val.	20	22
Gilt, plated and japanned wares,	per ct. ad val.	20	22
Glue,	per lb.	5	$5\frac{1}{2}$
Gold and silver watches, gold and silver lace, embroidery and epaulets,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
Gold leaf, and all articles not free and not subject to any other rate of duty,	per ct. ad val.	15	$16\frac{1}{2}$
Gum Arabic,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
Senegal,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
Goods, wares and merchandise, not herein otherwise particularly enumerated and described,	per ct. ad val.	15	$16\frac{1}{2}$
Gunpowder,	per lb.	8	$8\frac{4}{5}$
H			
Hats or Caps of wool, fur, leather, straw, chip or silk,	per ct. ad val.	30	33

ARTICLES.	Ad valorem or Specific.	Imported in Am. ves.	Imported in For. ves.
Hempen Cloth or Sail Cloth, except Russian and German linens, Russia and Holland duck,	per ct. ad val.	20	22
Hemp,	per cwt.	150	165
Hoop Iron,	per cwt.	250	275
I			
Indigo,	per lb.	15	16½
Iron, hoop, slit and sheet,	per cwt.	250	275
In bars and bolts, except Iron manufactured by rolling,	per cwt.	45	49½
In bars or bolts when manufactured by rolling,	per cwt.	150	156
Jewellery,	per ct. ad val.	7½	8¼
L			
Lace of gold and silver,	per ct. ad val.	7½	8¼
Leather and all manufactures of leather, or of which leather is the material of chief value, [not otherwise particularly enumerated,]	per ct. ad val.	30	33
Lead, in pigs, bars or sheets,	per lb.	1	$1\frac{1}{10}$
red or white, dry or ground in oil,	per lb.	3	$3\frac{3}{10}$
Shot,	ditto,	2	2⅕
Linen Manufactures, whether printed, stained or otherwise,		15	16½
Lisbon and Oporto wine,	per gallon,	50	55
Looking Glasses,	per ct. ad val.	20	22
M			
Manufactures of brass, copper, iron, steel, pewter, lead or tin, or of which these materials or either of them, is the material of chief value, except otherwise subject to a different duty,	per ct. ad val.	20	22

ARTICLES.	Ad valorem or Specific.	Imported in Am. ves.	Imported in For. ves.
Manufactures of woollen of all descriptions, or of which wool is the material of chief value, excepting blankets, woollen rugs, woollen stockings and worsted or stuff goods, for three years from the commencement of the present law, and after that date 20 per cent. on said goods.	per ct. ad val.	25	27½
Manufactures of Cotton of all descriptions, or of which cotton is the material of chief value, except stockings, bonnets, caps or hats, made of cotton, for three years from the commencement of the present law, and after that date 20 per cent. on said goods,	per ct. ad val.	25	27½
Matts of grass or flags, and painted floor cloths,	per ct. ad val.	30	33
Mace,	per lb.	100	110
Millinery of all sorts,	per ct. ad val.	30	33
Molasses,	per gallon,	5	5½
Mustard,	per ct. ad val.	30	33
N			
Nails,	per lb.	3	$3\frac{3}{10}$
Nankeens,	per ct. ad val.	25	27½
Nutmegs,	per lb.	60	66
O			
Ornament for head dresses,	per ct. ad val.	30	33
Ochre, dry,	per lb.	1	$1\frac{1}{10}$
in oil,	per lb.	1½	$1\frac{13}{20}$
Oil, sallad,	per ct. ad val.	30	33
olive in casks,	per gallon,	25	27½
spermaceti of foreign fishing,	ditto,	25	27½

ARTICLES.	Ad valorem or specific,	Imported in Am. ves.	Imported in For. ves.
Oil, Whale or other fish of foreign fishing,	per gallon,	15	$16\frac{1}{2}$
Olives, capers, pickles, comfits or sweetmeats in sugar or brandy,	per ct. ad val.	30	33
P.			
Paper of every description,	per ct. ad val.	30	33
Pasteboard and paper hangings,	ditto,	30	33
Pepper,	per lb.	8	$8\frac{4}{5}$
Pimento,	ditto,	6	$6\frac{3}{5}$
Playing cards,	per pack,	30	33
Printing types,	per ct. ad val.	20	22
Pickles, capers, olives, comfits, mustard, or sweetmeats, preserved in sugar or brandy,	per ct. ad val.	30	33
Porcelain and glass manufactures, other than window glass and black quart bottles,	per ct. ad val.	20	22
Plums and prunes,	per lb.	3	$3\frac{3}{10}$
Powders, balsams, oils, waters, tinctures, perfumes and cosmetics, &c.	per ct. ad val.	30	33
R.			
Raisins in jars and boxes, and muscadel,	per lb.	3	$3\frac{3}{10}$
all other kinds	per lb.	2	$2\frac{1}{5}$
Red and white lead, dry or ground in oil,	per lb.	3	$3\frac{3}{10}$
Saddles, bridles and harness,	per ct. ad val.	30	33
Salt per bushel of 56 lbs.		20	22
Saltpetre,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
Segars,	per 1000,	250	275
Sail cloth and hempen cloth, except Russia and German linens, and Russia and Holland ducks,	per ct. ad val.	20	22
Sattins and other silks and silk stockings,	d to,	15	$16\frac{1}{2}$
Spanish brown and paint-			

ARTICLES.	Ad valorem or specific.	Imported in Am. ves.	Imported in For. ves.
ers' colours, not subject to specific duties,	per ct. ad val.	15	$16\frac{1}{2}$
Spikes,	per lb.	3	$2\frac{1}{5}$
Soap,	ditto,	2	$3\frac{3}{10}$
Shoes and slippers of silk,	per pair,	30	33
of leather,	ditto,	25	$27\frac{1}{2}$
for children,	ditto,	15	$16\frac{1}{2}$
Snuff,	per lb.	12	$13\frac{1}{5}$
Steel,	per cwt.	100	110
Stockings of wool or cotton,	per ct. ad val.	20	22
Stones, precious of all kinds, set or not set, and Bristol stones, and paste work.	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
Spirits distilled in foreign countries from grain.			
First proof,	per gallon,	42	$46\frac{1}{5}$
Second proof,	ditto,	45	$49\frac{1}{2}$
Third proof,	ditto,	48	$52\frac{4}{5}$
Fourth proof,	ditto.	52	$57\frac{1}{5}$
Fifth proof,	ditto,	60	66
Above fifth proof,	ditto,	75	$82\frac{1}{2}$
Spirits from other materials than grain,			
First and 2d proof,	per gallon,	38	$41\frac{4}{5}$
Third proof,	ditto,	42	$46\frac{1}{5}$
Fourth proof,	ditto,	48	$52\frac{4}{5}$
Fifth proof,	ditto,	57	$62\frac{7}{10}$
Above fifth proof,	ditto,	70	77
Silver manufactures,	per ct. ad val.	$7\frac{1}{2}$	$8\frac{1}{4}$
Stone and earthen ware,	ditto,	20	22
Sugar brown	per lb.	3	$3\frac{3}{10}$
white, clayed or powdered,	ditto,	4	$4\frac{2}{5}$
lump,	ditto,	10	11
loaf and sugar candy,	ditto,	12	$13\frac{1}{5}$
T.			
Tallow,	per lb.	1	$1\frac{1}{10}$
Tarred cordage and cables,	ditto,	3	$3\frac{3}{10}$
Teas from China,			
Bohea,	per lb.	12	$13\frac{1}{5}$
Souchong and other black,	ditto,	25	$27\frac{1}{2}$

ARTICLES.	Ad valorem or specific.	Imported in Am. ves.	For. ves.
Teas, Imperial, gunpowder, and gomee,	per lb.	50	55
Hyson and young hyson,	ditto,	40	44
Hyson skin, and other green,	ditto,	28	30⅘
Teas from any other place, or in any other than ships of the United States,			
Tea bohea,	ditto,	14	14
Souchong and other black,	ditto,	34	34
Imperial, gunpowder, and gomee,	ditto,	68	68
Hyson and young hyson,	ditto,	56	56
Hyson skin and other green,	ditto,	38	38
Teneriffe wine,	per gallon,	40	44
Tin manufactured and in sheet,	per ct. ad val.	20	22
Tobacco manufactured other than snuff and segars.	ditto,	10	11
Twine,	per lb.	4	4⅖
Twist, of cotton yarn or thread, bleached,	per ct. ad val.	25	27½
U.			
Umbrellas and parasols or parts thereof,	per ct. ad val.	30	33
Vellum,	per ct. ad val.	30	33
W.			
Watches of all descriptions and parts thereof,	per ct. ad val.	7½	8¼
Waters, washes, cosmetics and balls,	ditto,	30	33
Whiting and Paris white,	per lb.	1	1⅒
Wine, Madeira, Burgundy, Champagne, Rhenish, and Tokay,	per gallon,	100	110
Sherry and St. Lucar,	ditto,	60	66
Lisbon, Oporto, and other Portugal wines, and those of Sicily,	ditto,	50	55

ARTICLES.	Ad valorem or specific.	Imposted in Am. ves.	For ves.
Wine, Teneriffe, Fayal, and other wines of the Western Islands,	per gallon,	40	44
All other when imported otherwise than in cases or bottles,	ditto,	25	27½
All other wines not enumerated when imported in bottles or cases	ditto,	70	77
Wire of iron or steel, not exceeding No. 18.	per lb.	5	5½
Over No. 18.	ditto,	9	$9\frac{9}{10}$
Brass,	per ct. ad val.	20	22
Wool,	ditto,	15	16½

The following articles are free of duty since 30th June 1816: —All articles imported for the use of the United States; philosophical apparatus, instruments, books, maps, charts, statues, busts, casts, paintings, drawings, engravings, specimens of sculpture, cabinets of coins, gems, medals, and all other collections of antiquities, statuary, modelling, painting, drawing, etching, or engraving, specially imported by order and for the use of any society incorporated for philosophical or literary purposes, or for the encouragement of the fine arts, or by order and for the use of any seminary of learning; specimens in natural history, mineralogy, botany, and anatomical preparations; models of machinery and other inventions: plants and trees; wearing apparel and other personal baggage in actual use, and the implements or tools of trade of persons arriving in the United States; regulus of antimony; bark of the cork tree, unmanufactured; animals imported for breed; burr stones, unwrought; gold coin, silver coin, and bullion; clay, unwrought; copper imported in any shape for the use of the mint; copper and brass, in pigs, bars, or plates, suited to the sheathing of ships; old copper and brass, and old pewter, fit only to be remanufactured; tin, in pigs or bars; furs, undressed, of all kinds; raw hides and skins; lapis calaminaris; plaster of paris; rags of any kind of cloth; sulphur or brimstone; barilla; Brazil wood, brazilletto, red wood, camwood, fustic, logwood, nicaragua, and other dye woods; wood unmanufactured, of any kind; zinc, teutenague, or spelter.

Note.—" And be it further enacted, that no drawback shall be allowed of the duties paid on any wines, or spirits which shall be imported into the United States after the 1st day of June 1818, unless such wines or spirits shall have been deposited in public or other stores under the provisions of this act, and there kept from their landing to their shipment."

Supplement.

On all cotton goods an addition of 20 per cent. from the Cape of Good Hope, or beyond it; or 10 per cent. from any other place; made to the original cost, from whence imported, the cost per square yard shall then be less than 25 cents; in that case the same shall be deemed to have cost 25 cents per square yard, and the duties be charged thereon with the usual advance first being added.

And if unbleached and uncoloured cotton, twist, yarn, or thread shall have cost less than 60 cents per pound; and if all bleached or coloured yarn, shall have cost less than 75 cents per pound; the former shall be taken at 60 cents, and the latter at 75 cents per pound, and the duty charged thereon, with the usual advance.

But cotton piece goods costing less than 25 cents per square yard, shall pay with the addition of 20 per cent. to the original cost only, 33⅓ per cent. duty, provided they are imported in American ships, having sailed from the United States, prior to 27th April, 1816, and shall arrive therein between the 30th June 1816, and the 1st day of June, 1817.—Notwithstanding by law after the 30th June, 1816, 10 per cent. is to be added to rates of duties, on all merchandise imported in vessels not of the United States. It shall not apply to merchandise imported in vessels not of the United States, entitled by treaty, or by any acts of congress, to enter in the ports of the United States, on the payment of the same duties, as are paid on merchandise, imported in vessels of the United Statse.

All parts of articles pay the same duty as the entire articles. No drawback is allowed on loaf sugar, foreign fish, or fish oil, snuff, and manufactured tobacco.

Deductions, &c. as Drawbacks.

From and after the 30th of June, 1802, the following deductions are made in cases of exportation, for benefit of drawback.

EXAMPLES.

	Dolls.	Cts.
If imported in American vessels, the value of 1500 dollars, pays duty 15 per cent.	225	0
Deduct 3½ per cent.	7	88
Net drawback,	217	12

Note—All merchandise having paid duties, on importation (except on goods imported in foreign vessels, from any of the dominions, colonies, or possessions of any foreign power to and with which the vessels of the United States are not permitted to trade: on foreign dried and pickled fish, and other salted provisions, fish oil, or playing cards,) and on exportation, the foreign duties shall be retained.

	Dolls.	Cts.
If imported in foreign vessels, the value of 1500 dollars, pays duty 16½ per cent.	247	50
Deduct 1½ per cent. the extra duty,	22	50
	225	0
And also 3½ per cent.	7	88
Net Drawback,	217	12

The drawback, therefore, on goods imported in foreign vessels renders the amount of the duty precisely the same as in American vessels.

Tonnage by Act of Congress, approved 2d of March, 1799, to be paid at the Time of Entry and before Clearance.

	Cents.
On vessels of the United States from foreign ports,	6
On vessels built in the United States after the 20th of July, 1789, but owned in part or wholly by foreigners, and duly recorded,	30
All other vessels,	50
Additional tonnage on foreign vessels, denominated *light money* by act of congress, 25th of March, 1804,	50
Vessels built in and belonging to citizens of the United States in coasting trade or fishery, pay only once a year, if licensed,	6
Vessels of the United States, not licensed, delivering merchandise from one district to another, unless in a navigable river, or an adjoining state, on the sea coast,	6
All other ships or vessels taking in merchandise to be delivered in another district,	50

Fees to Collector and Naval Officer.

	Dolls.	Cts.
Entry of a vessel of 100 tons or upwards	2	56
Clearance of ditto,	2	50
Entrance of vessel under 100 tons,	1	50
Clearance of ditto,	1	50
Every post entry,	2	0
Permit to land goods,	0	20
Every bond taken officially,	0	40
Permit to land goods for exportation, for drawback,	0	20
For every official certificate or bill of health,	0	20
Every other official document (register excepted)	0	20

Fees to Surveyor.

	Dolls.	Cts.
For measurement of a vessel of 100 tons and under, per ton,	0	1
For ditto, 100 to 200 tons,	1	50
For ditto, above 200,	2	0
On each vessel of 100 tons and upwards, with goods subject to duty,	3	0
On each vessel under 100 tons, with ditto,	1	50
All vessels not having goods subject to duty,	0	$66\frac{2}{3}$

Duties payable in

	Dolls.	Cts.
Gold coins of Great Britain and Portugal, of the standard prior to 1792, every 27 grains	1	0
Gold coins of France, Spain, and the dominions of Spain, $27\frac{2}{5}$ grains,	1	0
Spanish milled dollars, 17 dwt. 7 grs.	1	0
Crowns of France, 18 dwt. 17 grs.	1	10

And in proportion for the parts of a crown.

Provided, that no foreign coin shall be received in payment of the above duties, which are not a legal tender for the payment of debts, unless they be authorized by a proclamation of the president of the United States.

Rates of Coins for estimating Duties.

	Dolls.	Cts.
Pound sterling of Great Britain,	4	44
ditto Ireland,	4	10
Livre Tournois of France,	0	$18\frac{1}{2}$
Florin or guilder of the United Netherlands,	0	40
Marc-banco of Hamburg,	0	$33\frac{1}{3}$
Rix-dollar of Denmark,	1	0
Rial plate of Spain,	0	10
Valloon of Spain,	0	5
Milrea of Portugal,	1	24
Tale of China,	1	48
Pagoda of India,	1	84
Rupee of Bengal,	0	50

Before the duties are calculated on all goods, wares, and merchandise, imported from or beyond the Cape of Good Hope, 20 per cent. is to be added to the actual cost, including all charges, except commission, outside packages, and insurance; and 10 per cent. if from any foreign port.

It is lawful for the president of the United States to establish proper regulations for estimating the duties on all goods, the original cost of which shall have been calculated in any depreciated currency, issued and circulated by any foreign government.

Allowance for Draught.

Any quantity of 1 cwt.	- - - -	1 lb.
Between 1 and 2 cwt.	- - -	2
2 and under 3 cwt.	- - - -	3
3 10 ditto,	- - -	4
10 18 ditto,	- - - -	7
18 and above,	- - - -	9

TARES.

On every whole chest of bohea tea,	70 lb.
Half ditto, ditto,	36
Quarter ditto, ditto,	20
Chest of hyson or other green tea, of 70 lb. and above,	20
Box of other tea, between 50 lb. and 70 lb.	18
Ditto, if 80 lb.	20
Ditto from 80 and upwards,	22

(The above to include ropes, canvas, and other coverings.)

On all other boxes of teas according to the invoice or actual weight thereof.

On coffee in bags,	2 per cent.
in bales,	3
in casks,	12
On sugar, other than loaf sugar, in casks,	12
in boxes,	15
in bags or mats,	5
On cocoa in casks,	10
in bags,	1
On pimento in casks,	16
in bags,	3
On cheese in hampers or baskets,	10
in boxes,	20
On candles in boxes,	8
On chocolate in boxes,	10
On cotton in bales,	2
in seroons,	6
On Glauber's salt, in casks,	8
On indigo, in barrels,	12
in other casks,	15
in seroons,	10
in bags or mats,	3

On nails in casks,	8 per cent.
On pepper in ditto,	12
in bales,	5
in bags,	2
On sugar-candy, in boxes,	10
On sugars, in boxes or casks,	18
On soap, in boxes,	10
On shot, in casks,	3
On twine, in casks,	12
in bales,	3

On all other goods according to the invoice thereof, as actual weight.

Allowance for Leakage and Breakage.

Two per cent. is allowed on the gauge of all merchandise contained in casks. Ten per cent. on all beer, ale, and porter in bottle; and five per cent. on all other liquors in bottles; to be deducted from the invoice quantity, in lieu of breakage; or, it is lawful, at the option of the importer, to compute the duties by tale on the actual quantity at the time of entry.

A General Abstract from the Revenue.

1.—*Of the Duty of Masters of Vessels.*

Every master of a vessel bound to the district of Nottingham, must, on penalty of five hundred dollars, deposit, for the surveyor of the port of Town Creek, a manifest of the cargo, unless he shall have previously delivered one to some officer of the customs coming on board; bound to the district of Rappahannock, with the surveyor of the Port of Urbanna; to the district of Bermuda Hundred, or City-Point, with the collector of Norfolk and Portsmouth, or of Hampton; to the district of South Quay, with the collector of Edenton. Which manifests the respective collectors and surveyors must, after registry, transmit, duly certified, to the officer with whom entry is to be made.

Also every master of a vessel, belonging wholly or in part to citizens of the United States, must, on arrival from any foreign country, have an accurate and true manifest of the cargo on board, including spirits, wines, teas; and, in default thereof, he forfeits the value of all goods not included in such manifest, signed by himself, or the person who has the command, and 500 dollars, unless due proof be made that no part of the cargo had been unshipped since taken on board, and that such manifest had been lost, or mislaid, or defaced, by accident, or was incorrect by mistake. Which manifest every master of a

vessel, as aforesaid, must, on penalty of a sum not exceeding five hundred dollars, produce to the first officer of the customs who shall appear on board after his arrival within four leagues of the coast of the United States; and also to the first such officer who shall appear on board after his arrival in a district in which any part of his cargo is to be discharged; delivering, in either case, a copy thereof, by himself subscribed. The production of the manifest, and receipt of the copy, such officer must certify respectively, on penalty of five hundred dollars, certifying, on the original, the day and year when produced, and the delivery of a copy; and, on the copy, the day and year it was delivered. More than one copy of the manifest must not be required by the officer or officers of any one district, who shall come on board. He must also transmit the said copy to the collector of the district to which such vessel is bound.

If any part of the cargo of such vessels as are laden with goods, and bound to the United States, have arrived within four leagues of the coast, be unladen previous to their coming into port, and being legally authorized to unlade, all the goods so unladen, and any vessel or boat, into which they may be put, forfeit, each, one thousand dollars, and every other person, aiding and assisting, treble the value of the goods unladen.—These forfeitures are not, however, incurred in case of unavoidable accident, necessity, or distress of weather, if duly noticed, and strictly proved.

Also: if, after any ship or vessel has arrived within the limits of a district of the United States, from a foreign country, she leaves, or attempts to leave it, (unless to proceed to a more inferior district,) previous to report and entry made, the master forfeits four hundred dollars. And the collector, naval officer, surveyor, or any revenue cutter, may arrest and bring her back; unless the departure was occasioned by distress of weather, duress of enemies, or other necessity, which in either case, must be strictly proved.

Farther: every master of a vessel (ships of war and public packets excepted) must, within twenty-four hours after his arrival in any port of the United States, (if the usual hours of business will permit,) make report thereof to the chief officer of the customs at the port, and within forty-eight hours, a farther report of the cargo, and deliver a manifest to the collector. In default of which, he forfeits one thousand dollars.

But masters of vessels, whereof only part of the cargoes is destined to any particular port of the United States, may, after paying or securing the duties of such part, and giving bond, equal to the amount of the duties on the remainder, that no part thereof shall be landed in the United States, without due entry, proceed to the port or place of their destination with such

goods as have been noted for such foreign port on the manifest, at the time of entry.

And, when the cargoes of any vessels are destined to ports in different districts, the master thereof may proceed from district to district, paying in each district the duties on such goods as may be delivered therein, and giving bond to the collector of the district where they first arrived, for their due entry in every other district, and also obtaining from the respective collectors, to whom any part of their cargoes may be reported, copies of such reports, and certificates of the quantity and particulars of the goods delivered. Any master, in default of obtaining such copy and certificate, or neglecting to produce them to any subsequent collector, forfeits five hundred dollars. But, in case of spirits, such certificate must be had from, and produced to, the officers of inspection.

The master or commander of any vessel must, within forty-eight hours after arrival, send a report to the surveyor or inspector, of all distilled spirits, wines or teas, on board, under a penalty of 500 dollars.

Sea-stores, being exempt from duty, must be designated as such in the master's report; and, if excessive, the duty may be estimated on the excess, the value whereof is forfeited unless such duty be paid; as also treble the value of any article thereof, if landed for sale. Vessels not bound to the United States, but putting in, in distress, the master and mate must, within twenty-four hours, make protest, setting forth the circumstances of the distress before a notary public, or other person duly authorized; and, within forty-eight hours, report of the cargo, as in other cases; and the distress being duly certified by the wardens of the port, permits may, if necessary, be granted for unlading, on payment of storage and the customary fees to the officers; the collectors causing the goods unladen to be stored, and if damaged, or if necessary in repairing the ship, allowing them (the duties thereon being first paid) to be sold.

Masters of vessels bound to foreign ports, previous to obtaining a clearance, must deliver to the collectors of the district, from which they are about to sail, manifests of their cargoes; and any master departing without delivering such manifest and obtaining a clearance, forfeits five hundred dollars.

The penalty of false swearing, as well of masters of vessels as of the owners or consignees of goods, or their factors or agents, is fine or imprisonment, or both; not exceeding, in case of the former, one thousand dollars; or of the latter one year.

Masters of vessels after arrival and entry, may proceed to foreign ports with goods, *noted on the manifest at the time of entry for such foreign port*, without paying duties thereon, on giving bond that the said goods shall be actually re-exported in

such vessel to a foreign port, but bonds are not required when vessels put in, in distress.

No master of a vessel, arriving at any port where there is a post-office, may report or make entry, till he has delivered to the postmaster all letters in his possession directed to any person within the United States, except those directed to the owner or owners of such ship or vessel. The master is to receive two cents for each letter so delivered.

2.—*Of the Duty of the Owners or Consignees of Goods.*

Within fifteen days after the master of any vessel shall have made report to the collector, the owners or consignees, or their factors or agents, must, on oath or affirmation, make entry, with the said collector, of the goods consigned to them, particularizing the marks, numbers, and contents, of each package; or, if in bulk, the quantity and quality; producing the original invoices, documents, and bills of lading, and declaring that, should any other goods afterwards appear to be consigned to them, they will make it known, in order to due entry thereof.

Articles exempt from duty, as clothes, books, household furniture, &c. must be separately and distinctly entered by their owner or his agent; who, according to the best of his knowledge, must make oath respecting such owner, his occupation, arrival, or expected arrival; and that the said articles are really intended for his or his family's use, and not for sale; which oath, being indorsed on the entry, must be subscribed by the person making it. And in case such person be not the real owner of the goods, he must give bond for 1000 dollars more than the duty and their value, that a like oath shall, within a year, be made of the real owner, either taken before the collector with whom the entry is made, or produced to him duly executed. A copy of which oath and entry must be transmitted to the secretary of the treasury. If an imperfect entry be made, the collector is to take the merchandise into his custody.

Report and entry must also be made on the re-importation of articles of the growth or manufacture of the United States. Such articles being duty-free, their identity must be carefully proved. For which purpose, the oaths of such persons as have knowledge of the facts are required, relative to the time of their exportation, the ship in which, and the person by whom, exported; and, if imported into any other district than that from which they were exported, a certificate from the collector of the district, certifying their exportation; such certificate, however, being dispensed with, where it cannot be immediately produced, on giving bond for its production within four months.

Goods not landed in fifteen days are to be sent to the public store, at the risk of the importer. If, at the end of nine months,

they are not entered, and the duties settled for, they are to be sold, after being advertised for one month. The surplus is paid into the treasury of the United States, for the benefit of the owners, on proof of their claim to the property. Perishable articles may be sold immediately.

No goods imported from a foreign country may be unladen till the duties, agreeable to an estimate made by the collector and naval officer, (where there is one at the port,) are paid or secured; and a permit, signed by the said collector, and countersigned by the said naval officer, (where there is one at the port,) granted; nor in any case, except by special license, unless between sunrise and sunset. Goods unladen in violation of these restrictions, (as also the vessel and her tackle, where the value of the goods amount to four hundred dollars) are forfeited; and every person concerned therein incurs a penalty of four hundred dollars, of being advertised in the public papers, and incapacity of holding office for seven years. Also, goods requiring to be weighed or gauged may not, on penalty of forfeiture, be removed from the wharf where first landed, without the presence of a proper officer, till it be done.

Goods entered under a fraudulent invoice are forfeited. When the collector shall suspect that the invoice of such goods does not correspond with the value, he may take them into his custody at the risk of the importer, till appraised; and in case of prosecution for the forfeitures before mentioned, other proof of the real value of the goods may be admitted, notwithstanding the appraisement.

Goods, whereof the entry does not specify the particulars, are required to be stored till the particulars are ascertained, and the duties adjusted. And in all cases, where the final adjustment of the duties exceeds the estimate thereof before taken, the difference is to be paid to the collector; and where it is less than such estimates, the party having paid or secured them agreeably thereto, the balance is to be refunded, or placed to the party's credit, as the case may be.

No duty can be demanded on goods, the growth or manufacture of the United States, if they have not been previously shipped for the benefit of drawback. When the goods so returned have been exported from a different district than the one into which they are imported, the importer, in addition to an oath, must give a bond, amounting to the sum of the duties, that, within six months, proof shall be adduced of their having been actually exported from the former district. The failure is attended with the forfeiture of the bond, and the payment of the penalty.

3.—*Of the Duty of the Officers of the Customs.*

The officers of the customs are required to take oath and give bond for the faithful discharge of the duties of their respective offices; and, for default of the former, they incur a penalty of two hundred dollars.

The collectors are impowered, in presence of the naval officer, where there is one, to administer the necessary oaths to masters of vessels, the owners of goods, &c. And collectors, naval officers, and surveyors of ports, may, in case of absence or sickness, act by deputy.

To superintend the delivery of goods, inspectors may be put and kept on board of vessels, while lying in port; or, while going from district to district, may prohibit any goods from being unladen without a permit, and, after sunset, secure the hatches, which may not be opened, except in their presence, on penalty of two hundred dollars. In like manner, the officers of the customs, including those of the revenue cutters, may, as well without as within their respective districts, go on board all such vessels as, bound to the United States, have arrived within four leagues of the coast, may demand manifests, examine the cargoes, and designate any trunk or package, being separate from the rest of the cargo, sealing the same, if thought proper, and transmitting to the collectors of the districts to which such vessels are bound, a particular account thereof; and any such trunk or package, on arrival, not appearing, or the seal being broken, subjects the master to a penalty of two hundred dollars. Such officers may, in like circumstances, make seizures, where goods are legally forfeited; and if, in any case, impeded or resisted in the execution of their duty, the person offending forfeits a sum not exceeding four hundred dollars.

Any officer who shall refuse, without cause, to certify a manifest, forfeits five hundred dollars.

Entries on the delivery of the cargoes of vessels must, when such a delivery is completed, be compared with the entries of the owners or consignees, and the result indorsed on the respective entries, and subscribed by the officers making the comparison. And, in case any package, which shall have been reported, be missing, the master forfeits five hundred dollars; but may save the penalty by making due proof, before proper authority, that no part of his cargo, since taken on board, had been unshipped, except as contained in his report, or that such disagreement was by accident or mistake.

And, when goods are damaged, or not accompanied with the original invoice, the duties may be ascertained by appraisement of two merchants, the collector choosing one, and the owner the other; or goods, not accompanied with invoices, may, at the

option and risk of the owner, be kept by the collector till the invoice be obtained. But goods entered and not invoiced are forfeited; and any collector suspecting invoices to be not according to the true value of the goods, may cause an appraisement thereof to be made, as in case of damaged goods. Officers may seize within or without their respective districts.

On suspicion of fraud, packages, whereof entry has been made, may, in the presence of two or more reputable merchants, be opened and examined; and, in case of disagreement, unless it be proved to have been by accident or mistake, such articles as disagree with their respective entries are subject to forfeiture. And any person purchasing goods liable to seizure, knowing them to be such, forfeits double their value.

Officers of the customs, demanding or receiving other than legal fees, incur a penalty of two hundred dollars; and, accepting a bribe or reward for conniving at a false entry of vessels or goods, a penalty of not less than two hundred, nor greater than two thousand dollars. And persons giving or offering such bribe or reward, incur a like penalty.

4.—*Of the Payment of Duties, &c.*

In all cases where the duties do not exceed fifty dollars, they must be paid immediately; but, where they exceed that sum, they may be either paid immediately, or the payment secured by bond; if accruing on West India goods, other than wine and salt, half in three, and half in six months; on salt in nine months; on wines, in twelve months; and on all other articles from Europe, teas excepted, one half in six, one quarter in nine, and the remainder in twelve months; which bond may, at the option of the obligor, either include one or more sureties, or, without sureties, be accompanied with a deposit of part of the goods. And the duties on teas may be secured on the same terms and stipulations as those on other goods; or by bond without sureties, in double their amount, payable in two years; the teas being deposited, at the risk and expense of importers, in warehouses agreed on between them and an inspector. And, in case of deposit, any part of the teas may be delivered to the owners, on paying or farther securing the payment of the duties, by bond, with sureties, to be paid, where the duties do not exceed one hundred dollars, in four months; where they exceed one hundred, and do not exceed five hundred dollars, in eight months; or, where they exceed five hundred dollars, in twelve months. But the credit by the last mentioned bond must not exceed two years from the deposit of the teas; the collector, then, having power to cause so much thereof to be sold at public auction, as will discharge the arrears of duties still due, with costs of sale; and the surplus to be restored to the owners.

Bonds for duties not being paid at the time they become due, the collectors are required to institute suits for their recovery; and, in case of insolvency, the debts due to the United States to have priority.

Any executor, administrator, assignee, &c. in case of death or insolvency, who shall pay any debt of the bankrupt or deceased, in preference to any sum due to the United States, becomes liable, in his own estate and person, for the satisfaction of the debt due to the States.

An interest of six per cent. per annum is charged on the principal of all bonds, on which suits shall have been commenced, from the time the bonds fall due till the date of their discharge.

5.—*Of the manner in which Goods must be imported.*

No foreign goods, wares, merchandise, shall be brought into the United States, if liable to duty, in any other mode than *by sea;* nor in any ship or vessel of less than thirty tons burthen, American tonnage; except to certain districts on the northern, northwestern, and western boundaries of the United States, adjoining to the dominions of Great Britain in Upper and Lower Canada, and the districts on the river Ohio and Mississippi.

Distilled spirits, wines and teas, must, on pain of forfeiture, and a penalty of 500 dollars, be landed under the superintendence of some officer of inspection, to whom all permits from collectors for their landing must be previously produced.

Distilled spirits may not be imported in any cask which shall not have been marked, pursuant to any law, respecting such spirits, on pain of forfeiture of the ship or vessel importing them. Nor may any distilled spirits, except arrack and sweet cordials, be imported in cases of less capacity than ninety gallons, on pain of forfeiture, unless such spirits shall be for the use of the seamen on board the said ship. The allowance not to exceed four gallons per man. Provided that the said spirits shall have been entered, in the manifest of such vessel, as part of her sea-stores. Ale, beer or porter, may not be imported in less casks than of the capacity of forty gallons, or in less packages than six dozen bottles, on pain of forfeiture thereof, and of the ship or vessel importing them.

No goods, other than household furniture and clothes of persons coming into the United States for the purpose of becoming inhabitants, may be brought from a foreign country into any district thereof, Louisville, Champlain, and South Hero excepted, in any other manner than by sea, nor by sea in vessels less than thirty tons burthen, on pain of forfeiture of all

such goods, and the carriages, teams or vessels, by which conveyed.

No refined loaf or lump sugar shall be imported into the United States from any foreign port or place, except in ships or vessels of the burthen of one hundred and twenty tons and upwards, and in casks or packages containing each not less than six hundred pounds, on pain of forfeiting the ships or vessels, and the loaf and lump sugar imported therein, except in such casks or packages as aforesaid.

No goods must be removed before they are gauged and weighed. Wine, spirits and teas, if gauged or weighed before being marked, without permission, are forfeited.

Bounties.

On every barrel of pickled fish exported, of the fisheries of the United States, 30 cents.

On every barrel of salted provisions exported, salted within the United States, 25 cents.

But the said bounties will not be allowed, unless the fish or salted provisions have been inspected and marked, agreeably to the laws of the respective States, where such laws are in force. The bounty is payable in six months from the date of the bond to be given; and not unless the certificates of landing at a foreign port be produced. The bond to be for double the amount of the bounty.

Drawbacks.

Goods imported into the United States, except foreign caught fish, fish-oil, playing cards, loaf-sugar, snuff, and manufactured tobacco, may be exported from any of the ports at which ships and vessels from the Cape of Good Hope, or from places beyond the same, may enter, under the following conditions:

Twenty-four hours notice to be given before shipping the goods; excepting distilled spirits, which require six hours. Good shipped without a proper permit, forfeit the drawback.

The goods must be exported from the ports of original importation, within one year from the payment, or of securing the duties thereon.

Or, they may be transported coastwise to certain districts, and may obtain the drawback, when exported thence to any foreign port but St. Augustine, Nova Scotia, Halifax, and Upper and Lower Canada.

Goods, entered in one district, and intended to be exported from another district, must be accompanied by a certificate from the collector of the district into which such goods were imported, specifying the marks, numbers, and descriptions of the casks or packages, with the names of the master and vessel in which, the time when, and the place whence, they were imported: and, where they pay duties by weight or measure, the quantity of each, and in all cases the amount of the duties paid or secured thereon.

To obtain the above certificate, an entry must be made out by the person applying, specifying the marks, numbers, and descriptions, of the casks, or packages, and their contents, the names of the master, and vessel in which, the time when, and the place whence, they were imported; the names of the master or vessel into which they are intended to be laden, and the district of the United States to which they are destined; and shall make oath or affirmation to the truth of such entry; such goods to be entered with the collector of the district into which they shall be brought previously to the unloading of the same. See *Form of Entry* (A.)

When articles are imported in bulk, the packages in which they are landed shall be deemed the packages of original importation, the goods must be exported in the same. All certificates for wines, teas, or distilled spirits, must be given in, or no drawback will be allowed.

Coffee in casks or other packages, liquors in casks, or any unrefined sugars, may be filled up out of other casks or packages, included in the original importation, or into new casks or packages, in case the original casks or packages shall be so injured as to be rendered unfit for exportation, provided it be done under the inspector of the port from which such merchandise is intended to be exported.

Where goods, entitled to drawback, shall be intended for exportation from any district other than the one into which they were imported, besides producing the certificate before directed, the person shall make an entry, and the goods shall undergo the same examination as is by law required, relative to goods intended for exportation.

For all goods entitled to drawback, exported from the district into which they were originally imported, the exporter shall receive from the collector of such district a debenture or debentures for the amount of such drawback, payable at the exact time or times on which the duties on such goods will become due; except the same shall be within three months, in which case the said debenture shall be payable in three months.

Distilled spirits, wines, and teas, are subject to seizure and 50 dollars fine, unless the certificate of the same be delivered

to the purchaser. If any cask, &c. be found in any one's possession, containing these articles, without being marked or accompanied by a certificate, the same is liable to seizure. On the sale of any cask, &c. its marks must be defaced in the presence of some officer, and the certificate delivered up; under the penalty of 100 dollars and costs of suit.

Where goods are exported from any district, other than the one such goods were imported into, the collector to grant the exporter a certificate of such exportation; and such certificate shall entitle the possessor thereof to receive, from the collector of the district where the duties on such goods were secured or paid, a debenture or debentures, for the amount of the drawback expressed in the said certificate, payable in the same manner as before mentioned. Provided that no drawback be allowed on goods where the duties on exportation do not amount to fifty dollars, or, on distilled spirits, to less than one hundred and fifty gallons; or on any tobacco, snuff, or refined sugar, imported into the United States from any foreign port; and, in case the exporter is the original importer, the drawback is not to be paid until the duties on the importation thereof shall have been first received.

Bonds to be given by the exporter previous to a certificate being granted or debentures issued, with security to the satisfaction of the collector, in a sum double the amount of such debenture or certificate, before clearance, or within ten days after; to produce the proofs required by law, in respect of their being landed within the limits of the United States, within one year, if exported to any port of Europe or America; or within two years, if to any port of Asia or Africa; which certificate shall be under the hand of the consignee at the foreign port or place to whom such goods shall have been addressed, particularly setting forth and describing the articles so exported, with their quantities and amount, and declaring the same to have been delivered from on board the vessel in which they were exported, at the said place: also a certificate confirming the truth of the foregoing certificate, under the hand and seal of the consul or agent of the United States, residing at the said place; together with the oath of the master and mate, if living, or, in case of their death, the oath of the two principal officers of the vessel in which the exportation shall be made.

If any goods, entered with intention to drawback the duties, be landed, within the limits of the United States, they and the ship are subject to seizure and forfeiture, and the crew of the vessels assisting in landing the same, to six months imprisonment.

Goods may be transported across the state of New-Jersey, by the following route to Philadelphia, and be exported thence

to a foreign port, and obtain drawback, viz.—New Brunswick, South Amboy, Lamberton, and Bordentown, or Burlington, by making an entry, as if transported by water; the said goods to be marked, previous to the lading, and obtaining the certificate. If they be transported by any other route than that directed by the passport, or if the marks, fastenings, or seals, on the merchandise, be broken, defaced, or unpacked, the goods that shall have sustained the injury are to be forfeited.

In case no consul or agent of the United States reside at the place of delivery, the certificate of the consignee to be confirmed by that of two respectable American merchants at such place: if there be no such American merchants, then by the certificate of two reputable foreign merchants, testifying that the facts are, to their knowledge, true, or that such consignee's certificate is, in their opinion, worthy of full credit. In cases of capture, loss at sea, or other unavoidable accidents, to offer for consideration such proofs as they may have in their power to produce.

Form of Appraiser's Oath and Certificate, when Goods are without Invoice, and when they are damaged.

We, A. B. and C. D. appointed by the collector of and to ascertain the contents and appraise the value of (*or the damage sustained by*) the merchandise contained in the packages described in the annexed entry or account (or imported by in the whereof is master, from), do solemnly, sincerely, and truly that

In case of Damage.

We have carefully examined the several packages hereafter enumerated and described, and find the several articles of merchandise, as particularly detailed, contained in the said packages, to have received damage, as we believe, during the voyage of importation, and that the allowance by us made for such damage, is, to the best of our skill and judgment, just.

So help us, God.

If the Invoice be missing.

The several articles detailed in the annexed appraisement, subscribed with our names, are a true and full account of all the merchandise whatsoever, contained in the several packages mentioned in such entry or account; and that the several prices by us affixed to each article are, to the best of our skill and judgment, the true and actual value or cost thereof at the place of exportation.—So help us, God.

Form of a Certificate to be returned by the Consignee, to whom Goods exported for Drawback are addressed.

We, or I, merchant, residing at do hereby certify that there has been landed and left here from on board the master, from the following merchandise (here particularize the packages, marks, numbers, and contents), which said goods were consigned to me by merchant, Witness our hands and seals, at this day of

The above certificate to be accompanied by one under the hand and seal of the American consul or agent (if any there); in lieu of this, a certificate of the following purport from two respectable American merchants, (if any resident there,) or, if not, of two reputable foreign merchants.

We, (American) merchants, residing at do hereby certify, that the contents of the within certificate, or above certificate (as may be), is, to our knowledge, just and true.

Or, where the facts are not actually within their own knowledge:

We, (American) merchants, residing at do certify, that from our knowledge of (the consignee) we think full faith and credit ought to be given to the within certificate.

Drawback to be allowed upon snuff manufactured within the United States, and sugar refined within the same, and which shall be exported to any foreign port or place, provided the same shall amount to twelve dollars and upwards.

Form of an Entry to be made out by a person applying for a certificate to accompany goods sent to another district for the purpose of being exported to a foreign port from such district.

Date of importation.	In what vessel imported.	Master's name.	From whence imported.	Mark.	Number.	Description and number of packages.	Contents.	Vessel's name in which laden.	Master's name.	Port.	District.

Form of an Entry outward for the benefit of Drawback.

Entry of merchandise intended for exportation, by on board the whereof is master, for for the benefit of drawback; which were imported into the district on the by in the master, from (and brought into this district on the in the master, from)

Before any permit is granted, the importer must prove the original importation, and the payment or settlement of the duties: and every other person, through whose hands the goods have passed, must prove the identity thereof.

The words in a parenthesis are to be omitted, when merchandise is exported from the port of original importation.

Marks.	Numbers.	Packages and contents.	Net cost of *ad valorem* articles, as having been paid duties.	Weight or gauge.	Tare and Draft, or allowance for leakage.

Oath to be taken by the Exporter where he is the Importer also.

I do solemnly that the several articles specified in the above entry were imported by me, or consigned to me (as the case may be), in the master from that they were duly entered by me at the custom-house of this port, and the duties paid or secured to be paid thereon (as the case may be:) that they are the same in quantity, quality, and package, (and value, if articles paying an *ad valorem* duty,) as at the time of importation, necessary or unavoidable wastage only excepted; and are now actually laden on board the master; and that they are truly intended to be exported by me, in the said vessel, to the port of and are not intended to be relanded within the United States. So help me, God.

Oath to be taken by the Importer, when the goods are sold and to be exported by another.

I do solemnly that the several articles specified in the above entry, were imported by me, or consigned to me (as the case may be), in the master, from that they were duly entered by me at the custom-house of this port, and the duties thereon paid, or secured to be paid (as the case may be); that they were the same in quantity, quality, and package, and value, necessary or unavoidable wastage only excepted (if articles pay an *ad valorem* duty,) at the time of sale, to as at the time of importation. So help me, God.

Where goods are exported by a person not the Importer.

I do solemnly that the several articles specified in the above entry were by me purchased of that they are now in quantity, quality, and package, and value (if articles paying an *ad valorem* duty), the same as at the time of purchase; necessary or unavoidable wastage only excepted; that they are now actually laden on board the master; and that they are truly intended to be exported by me, in the said vessel, to the port of and are not intended to be relanded within the United States. So help me, God.

Any goods, subject to duty, being entered after the last day of May, 1795, by any agent, factor or persons, other than the *bona fide* owner, or consignee, of such merchandise, the person so entering them is to give bond, in the sum of one thousand dollars, over and above what the duties may amount to, with condition, that the *bona fide* owner or consignee of such merchandise shall, on or before the first period of the payment of said bond becomes due, deliver to the collector a correct account of said merchandise, in legal manner and form, in respect to an entry previous to the landing of any merchandise, to be verified as in the case of an entry, by a like oath or affirmation, before any judge of the United States, or the judge of any court of record of estate, or before a collector of the customs: and in case the duties are paid at the time of entry by such agent or factor, to give bond in the penal sum of one thousand dollars, that such an account from the *bona fide* owner or consignee, as above required, shall be delivered to the said collector within ninety days.

Duties on goods imported to be paid as follows, where the sum, payable by one person or copartnership, shall amount to more than fifty dollars.

From and after the 1st day of June, 1818, the credit on duties from all places situated on the eastern shores of America, north of the equator or in its adjacent seas, bays and gulphs, salt excepted, shall be one half in six and one half in nine calendar months; and on goods (other than wine, salt and teas) imported from any other place than Europe and the West Indies, one third in eight, one third in ten, and one third in eighteen calendar months.

The valuation of goods subject to the payment of duties *ad valorem*, shall be made upon the actual cost at the place of exportation, including all charges (commissions, outside packages and insurance, only excepted).

The duties on wines shall not be less than ten cents per gallon. Bottles, in which liquors are imported, to pay the same duty as empty bottles.

All parts of articles to be subject to the same duties as the ntire article is subject to.

The master or commander of any vessel that shall obstruct or hinder (or be the cause of obstructing or hindering) any officer of the revenue in going on board his ship or vessel, for the purpose of carrying into effect any of the revenue laws of the United States, shall forfeit a sum not exceeding five hundred, and not less than fifty dollars.

Persons breaking fastenings in presence of an officer, forfeit two hundred dollars.

Drawbacks of six cents per pound allowed on snuff, manufactured within the United States, after the last day of March, 1795, provided the quantity exported, at any one time, by the same person, shall amount to three hundred pounds, and the same be exported from any of the ports, at which ships or vessels from the Cape of Good Hope, or from any place beyond the same, are admitted to make entry.

Before removal from the mill or warehouse, an entry must be made out, specifying the outward packages, in which the same is intended to be exported; the name of the manufacturer, the marks and numbers of each, the quantity of snuff in each package, and the number of bottles, canisters, bladders, or other packages, containing the same; the name of the vessel and master, in which the said snuff is intended to be exported; and the truth of such entry must be sworn to; and that the snuff therein specified was manufactured in the United States after the last day of March 1795, and the name of the person by whom, and the mill where, it was manufactured, and that the same is truly and *bona fide* intended to be exported out of the United States, and that no part thereof is intended to be relanded therein. The goods are then to be inspected and laden on board, as in the cases of other exportations.

Bonds to be given by the exporter, with one or more sureties, in a sum double the amount of drawback; conditioned that the same shall not be relanded within the United States, and the master of the vessel in which such snuff is shipped shall swear that the packages specified in the outward entry are actually laden on board his vessel, and that the same, or any part thereof, shall not be relanded within the United States. The above conditions being complied with, a debenture or debentures to be granted for the amount of the drawback on such snuff, payable in twelve months from the time of granting the same, to be paid by the collector issuing out such debenture; provided the person demanding the same shall produce to the collector the oath or affirmation of the master and mate of the vessel in which the snuff for which such debenture was granted was exported; declaring that it was actually landed in some foreign port or place, and was not, or any part thereof, to the best of their knowledge and belief, relanded or brought back to the United States:

and the person demanding such payment shall likewise swear that the snuff, for which such debenture was granted, was not, according to his best knowledge and belief, relanded and brought back to the United States.

Snuff, if exported for drawback, if relanded, or attempted to be relanded, to be forfeited, together with the ship or vessel from which the same is unladen, and the vessel or boat in which it shall be put; and the master of the ship or vessel shall forfeit and pay five hundred dollars.

Form of the Entry for Exportation of Snuff.

Entry of Snuff intended to be exported by in the master, for Philadelphia.

Marks.	Numbers.	Outward Packages.	Number of Bottles.	Number of Bottles, Canisters, or Bladders.	Quantity of Snuff in each Package.	Manufacturer's Name.	Name of the Vessel.	Master's Name.	To what Place exported.

Drawback of five cents per lb. allowed on sugar refined within the United States. The exporter to give notice of such exportation to the inspector of the port, and make entry thereof; and to make oath before the collector, that the sugar, so laden on board the vessel specified in such entry, is truly intended to be exported to the place mentioned in such entry; and that they believe the duties thereupon have been truly paid, or secured to be paid, and shall give bond to the collector, with two sureties; one of whom shall be the master of the ship or vessel, in which the said sugar shall be intended to be exported, in the full value of said sugar, with condition, that such sugar shall be really and truly exported to and landed in some port, or place, without the limits of the United States; such drawback not to be paid until nine months after exportation.

The bond, as above given, to be cancelled, by producing, within one year from the date thereof, if shipped to any part of Europe or America; and within two years, if shipped to any part of Asia or Africa, a certificate of the consul, or other agent of the United States, if any reside at the port or place where delivered; if no consul or agent, a certificate of two known and reputable American merchants residing at such place; if there be not two such merchants, then a certificate of any othertwo reputable merchants, testifyin gthe delivery of suc sugar at the said place; which certificate shall be confirmed by the

oath of the master and mate, or like officer, of such vessel: and, when the certificate shall be from any other than a consul, or agent, or merchants of the United States, it shall be a part of the oath of the master and mate, that there were not, upon diligent inquiry, to be found two merchants of the United States at the said place.

Sugar so laden for exportation, if relanded or unshipped within four leagues of the coast of the United States, unless in case of necessity or distress, notice whereof shall be immediately given to the principal officer of the customs residing nearest to which such vessel may be, shall be forfeited, together with the ship or vessel on board of which the same shall have been shipped, with her furniture, &c. and the vessel, &c. into which such sugar shall be unshipped or put.

Form of a Manifest for an American Vessel.

Report and manifest of the cargo on board the laden at the port of master, burthen tons, built at in the of and belonging to merchant at as per register granted at and bound for Philadelphia.

Marks.	Numbers.	Packages & Contents.	By whom shipped.	To whom consigned.	Place of Consignees' residence.	Ports of Destination.

N. B. When an American vessel has goods on board for more than one port, they must be placed separately on the manifest.

When the consignees are not known, the shippers must be given.

Returned Cargo.

If any articles of the outward cargo are brought back, they are to be detailed, specifying, by whom shipped outward, and to whom consigned inward.

Return of Passengers, and of Packages belonging to them respectively.

Here insert the names of the passengers, and the place of their residence, on board; with the description and number of packages, containing their baggage, or the tools or implements of a mechanical trade.

Form of a Manifest for a Foreign Vessel.

Report and manifest of the cargo, laden on board the master, burthen bound to which cargo was taken on board at

Marks.	Numbers.	Packages and Contents.	By whom shipped.	To whom consigned.	Place of Residence.	Place of Consignee's Residence.	Ports of Destination.

N. B. When the consignees are not known, the shippers must be given.

Besides the above, the master of every American vessel to make the following

Return of seamen on board the master; shewing also the names, the time for which they were respectively employed, and the sum retained out of the wages of each.

Whole number employed.	Names of Seamen and the time for which they have been respectively employed.	Time employed.		Sums retained out of Seamen's Wages to be paid over to the Collector.	
	Names.	Months.	Days.	Dollars.	Cents.

The master is authorized by law to retain from each seaman so returned, the sum paid for them to establish a Marine Hospital.

Oath to be taken by the Master on coming to an Entry respecting the delivery of his letters at the Post Office.

I do solemnly that I have delivered, to the post-master of this city, all letters directed to any person or persons within the United States, which, under my care, or within my power, have been brought in the myself master, from those directed for the owner or owners, consignee or consignees, of the vessel excepted. So help me, God.

On presenting his Manifest.

I do solemnly that the report or manifest, now delivered by me to the collector of this district, contains to the best of my knowledge and belief, a true account of all the goods, wares, and merchandise, which were on board the at the time of her sailing from the port of or which have been laden or taken on board at any time since, and that the packages of the said goods are as particularly described as in the bills of lading, signed for the same, by me and with my knowledge; that I am at present, and have been during the voyage, master of the said vessel (*or how long;*) that no package whatsoever, or any goods, wares, or merchandise, have been unladen, landed, or taken out, or in any manner whatever removed from on board the said since her departure

from the said port of except such as are now specified and declared in the account herewith, and that the clearance and other papers now delivered by me to the collector, are all that I now have or have had, that any way relates to the cargo of the said vessel. And I do further that the several articles specified in the said manifest, as the sea-stores for the cabin-vessel are truly such, and were *bonâ fide* put on board the said for the use of the officers, crew, and passengers thereof, and have none of them been brought nor are intended for merchandise or sale, or any other purpose than above mentioned, and are intended to remain on board for the consumption of the said officers and crew. I further that if I shall hereafter discover, or know of, any other or greater quantity of goods than are contained in the report and manifest, subscribed, and now delivered by me, I will immediately, and without delay, make due report thereof, to the collector of the port and district of and I do likewise that all matters whatsoever in the said report or manifest expressed, are, to the best of my knowledge and belief, just and true.

(Add if necessary.)

I further that no officer of the customs has applied for any inspection of the manifest of the cargo on board the said vessel, and that no certificate or endorsement has been delivered to me on any manifest of such cargo. So help me God.

Signed, A. B.

Sworn (or *affirmed*) before me this day of } C. D.

Form of Entry by an American Vessel.

Entry of merchandise imported by in the master, from Philadelphia, 1822.

Marks.	Numbers inclusive.	Packages & contents.	Quantity per Invoice of articles subject to specific duties.	Value of articles subject to specific duties.	Value subject to 15 per cent. *ad valorem*.	Value subject to 17½ per cent. *ad valorem*.	Value subject to 22½ per cent. *ad valorem*.	Amount of Free Goods.	Charges not subject to Duty.	Total Amount per Invoice.

Form of Entry by a Foreign Vessel.

Entry of merchandise imported by in the master, from 1822.

Marks.	Numbers inclusive.	Packages & contents.	Quantity per Invoice of Articles subject to specific duties.	Value of Articles subject to specific Duties.	Value subject to $16\frac{1}{2}$ per cent. *ad valorem.*	Value subject to $19\frac{1}{4}$ per cent. *ad valorem.*	Value subject to $24\frac{3}{4}$ per cent. *ad valorem.*	Amount of Free Goods.	Charges not subject to Duty.	Total Amount per Invoice.

Oath to be taken on making either of the above Entries.

District of port of

I do solemnly that the entry, now delivered by me to the collector of this district, contains, to the best of my knowledge and belief, a true account of all the goods, wares, and merchandise, imported by me, or consigned to me, in the master, from the port of and that the said entry also contains a true account of the net prime cost thereof: and that the invoice and bill of lading, herewith produced, are the true and genuine ones by me received, of the said goods, wares, and merchandise. And if I shall hereafter discover any other or greater quantity of merchandise than is contained in the entry aforesaid, I will forthwith make due report of the same to the said collector. And I farther that all matters whatsoever, in the said entry expressed, are, to the best of my knowledge and belief, just and true. So help me, God.

Form of an Entry for Baggage, Household Furniture, and Implements of Trade, &c. of Persons coming to reside in the United States.

Entry of baggage, wearing apparel, &c. imported by in the master from New York,

[*Here the particulars to be inserted.*]

District of port of

I do solemnly, sincerely, and truly that the entry subscribed by me, and hereunto annexed, contains, to the best of my knowledge and belief, a just and true account of the contents of the several mentioned in the said entry, imported in the from and that they contain no goods, wares, or merchandise whatever, other than the wearing apparel and other personal baggage, [*or*

if the case require,] (and the tools of the trade of all which are the property of who has or have arrived, who is or are shortly expected to arrive, in the United States; and are not, directly or indirectly, imported for any other person or persons, or intended for sale. So help me, God.

Form of an Entry for Goods intended to be transported across the Jersey to New York.

Entry of merchandise intended to be transported by of the city of merchant, across the state of New Jersey, to New York,

Marks.	Numbers.	Number and Description of Packages	Contents.	By whom sent.	To whom consigned.

Report of distilled spirits, wines, and teas, imported in the whereof is master, from bound to

Marks.	Number of Casks, Chests, and ackages, inclusive.	Description of casks, &c.	Kinds and qualities of Spirits, Wines, Teas, &c.	Estimated gallons of Spirits of each kind.	Estimated gallons of Wines of each kind.	Estimated pounds of Teas of each kind.	To whom consigned.	Where consigned.

Sea stores, consisting of spirits, wines, and teas.

Signed, A.B master of

To

Inspector of the Revenue

for the Port of

Form of an Entry of Goods, &c. of the Growth, Product, or Manufacture of the United States, returned.

Entry of merchandise exported from the district of in the master, for on the day of and returned in the master, from Philadelphia. 1822.

Marks.	Numbers.	Packages and Contents.

Oath to be taken by the Person making the above Entry.

I do solemnly that the several articles, specified in the above entry, are truly of the growth, product, or manufacture of the United States, and that they were duly exported and imported as above mentioned.

N. B. When the goods so returned are exported from any other district than the one they may be imported into, bonds must be entered into by the importer, in addition to the above oath, in the amount of the duties, that, within four months from the date thereof, a certificate shall be produced, from the collector of the customs for the district whence they were exported; that such goods were actually so exported: in default of which, the bond to be forfeited and penalty paid.

Form of an Entry Outward for the Benefit of Bounty.

Marks as branded on the Casks.	Number of Barrels.	Descriptions and Species of Fish and Provisions.

Oath to be taken on exporting Goods for the Benefit of Bounty.

Entry of intended to be exported in the master, for for the benefit of bounty.—Philadelphia, 1822.

I do solemnly that the salted provisions, expressed in the entry now delivered by me to the collector of this district, are truly salted provisions of the United States; and that the quantity of pickled fish therein expressed is actually of the fisheries of the United States; that they are now actually laden on board the whereof is master, and are to be exported to and are not intended to be landed within the limits of the United States. So help me God.

Form of the Oath of the Master and Mate of the vessel in which Foreign Spirits have been exported from the United States to Foreign Ports, to be produced to the Custom House, in order to cancel the Bond given on the Exportation thereof, together with the Certificate here following.

We, master, and mate of the do solemnly that there has been landed from on board the said and left at ten puncheons of rum, and twenty cases of gin, marked and numbered as per margin, which said rum and gin were shipped on board the aforesaid by merchant at Philadelphia. And we farther that we have made diligent inquiry, and that

there were not to be found two American merchants residing at the aforesaid port of

N. B. The latter part of the oath is necessarily omitted, when the certificate produced is either from an American consul, or two merchants of that description.

Form of a Manifest outwards.

Report and manifest of the cargo laden at the port of on board the master, bound for port of

Marks.	Numbers.	Packages or Articles in bulk.	Contents or quantities.	Value at the port of exportation.

Manifest Oath on Outward Cargo.

District of

I, master or commander, of the bound from to do solemnly that the manifest of the cargo on board of the said, now delivered by me to the collector of this district, and signed with my name, contains, according to my best knowledge and belief, a full, just, and true account of all the goods, wares, and merchandise, now actually laden on board the said vessel, and of the value thereof; and if any other goods, wares, or merchandise shall be laden or put on board the said previous to her sailing from this port, I will immediately report the same to the said collector. I do also that I verily believe that the duties on all the following merchandise therein specified, to have been paid or secured according to law, and that no part thereof is intended to be relanded within the United States; and that, if by distress, or other unavoidable accident, it should become necessary to reland the same, I will forthwth make a just and true report thereof to the collector of the customs of the district wherein such distress or accident may happen. So help me God.

Master's Oath on clearing out.

I do solemnly that the manifest now delivered by me to the collector of this district, contains a just and true account of all the cargo on board the vessel called and whereof I am at present master. So help mé, God.

Manifest for a Coasting Vessel.

Manifest of the cargo on board the master, burthen tons, bound from for

Marks and Numbers.	Number of entries.	Packages & contents.	Shippers.	Residence.	Consignee.	Residence.

Extract from the Act of Congress, passed on the twenty-sixth day of February, 1795, entitled, " An Act, supplementary to the Act, entitled, " An Act to provide more effectually for the Collection of the Duties on Goods, Wares, and Merchandise imported into the United States, and on the Tonnage of Ships or Vessels."

Sect. 9th. " And be it further enacted, That all bonds which may be given for any goods, wares, or merchandise, exported from the United States after the last day of May next, and on which any drawback of duties, or allowance, shall be payable in virtue of such exportation, shall and may be discharged; and not otherwise, by producing, (within one year from the date thereof, if the exportation be made to any part of Europe or America, or within two years if made to any part of Asia or Africa,) a certificate under the hand of the consignee, at the foreign port or place, to whom the said goods, wares, or merchandise, shall have been addressed, therein particularly setting forth and describing the articles so exported, with their quantities or amount, and declaring that the same have been delivered from on board the vessel in which they were exported, at the said place; as also, a certificate under the hand and seal of the consul or agent of the United States, residing at the said place, declaring either that the facts stated in such consignee's certificate are to his knowledge true, or that the certificate of such consignee is, in his opinion, deserving of full credit; which certificate of the consignee and consul or agent, shall, in all cases, as respects the landing or delivery of the said goods, wares, or merchandise, be confirmed by the oath of the master and mate, if living, or, in case of their death, by the oath or affirmation of the two principal surviving officers of the vessel in which the exportation shall be made. And, in cases where there shall be no consul or agent of the United States residing at the said place of delivery, the certificate of the consignee, before required, shall be confirmed by the certificate of two reputable American merchants, residing at the said place: or, if there be no such American merchants, then by the certificate of two reputable foreign merchants, testifying, that the facts stated in such consignee's certificate are, to their knowledge, true; or that such consignee's certificate is, in their opinion, worthy of full credit; which certificate shall be supported by the oath or affirmation of the master and mate, or other principal officers of the vessel, in the manner before described. And, in cases of loss at sea, or by capture, or by other unavoidable accident; or when, from the nature of trade, the proofs and certificate before mentioned are not, and cannot be produced; the exporter or exporters shall be allowed to adduce, to the

collector of the port of exportation, such other proofs as they may have, and as the nature of the case will admit; which proof shall, with a stating of all the circumstances attending the transaction, within the knowledge of such collector, be transmitted to the comptroller of the treasury, who shall, if he be satisfied with the truth and validity thereof, have power to direct the bonds of such exporter or exporters to be cancelled.

[To obviate embarrassments from the want of a general knowledge of the section of the act before recited, and to introduce uniformity in the proofs required for cancelling bonds given on the exportation of merchandise, the annexed forms of documents have been prepared at the treasury, and their use is recommended.]

(A.)

Form of the Certificate of Consignee, declaring the Delivery of Merchandise at a foreign Port.

I, (A. A. or we, B. B. and C. C.) of the (city or town) of (merchant or merchants, and copartners in trade,) do hereby certify, that the goods and merchandise herein-after described have been landed in this city, town, or port,) between the tenth and twentieth days of from on board the of whereof G. G. is at present master viz.

A. B. No. 1 *a* 10, ten hogsheads, C. D. No. 3, 6, 9, 15, four tierces,	Containing fourteen thousand pounds weight of coffee.
E. F. No. 14, 18, 22, 25, 27, 30, 33, 36,	Eight hogsheads, containing ten thousand pounds weight of brown sugar.
G. H. No. 21. *a* 30,	Ten chests containing seven hundred pounds weight of hyson tea.
I. K. No. 7, 16, 19,	Three bales containing one hundred and fifty pices of nankeen.

Which, according to the bills of lading for the same, were shipped on board the at the port of , in the United States of America, on or about the second day of August, 1821, and consigned to (me, or to us, by I. I. of the of aforesaid merchant).

Given under my hand, at the city of this day of

(B.)

Form of the Oath or Affirmation of the principal officers of a vessel, confirming the landing of merchandise at a foreign port.

Port of ———

We, G. G. master, and H. H. mate, of the of lately arrived from the port of in the United

States of America, do solemnly (swear or affirm), that the goods or merchandise, enumerated and described in the preceding certificate, dated the day of and signed by A. A. of the city of merchant, was actually delivered in this port from on board the said within the time specified in the said certificate.

(Sworn, or affirmed), at the city of
before me, this day of

(C.)

Form of a Verification of the delivery of merchandise at a foreign port, to be executed by a Consul or Agent of the United States.

I, M. M. (consul or agent of) the United States of America, at the city of do declare, that the facts set forth in the preceding certificate, subscribed by A. A. of the said city, merchant, and dated the day of are, (to my knowledge, just and true; or are, in my opinion, just and true, and deserving of full faith and credit.)

In testimony whereof, I have hereunto subscribed my
(SEAL) name, and affixed the seal of my office, at the city of
this day of

(D.)

Form of a Verification of the delivery of merchandise, to be executed by American merchants, or by foreign merchants, if there be no American, at a port where no Consul or Agent of the United States resides.

We, the subscribers, (being American merchants) residing in the city of do declare, that the facts stated in the preceding certificate, signed by A. A. of the said city, merchant, on the day of are (to our knowledge, just and true; or are, in our opinion, just and true, and worthy of full faith and credit; we also declare that there is no consul or other public agent for the United States of America, or American merchants, (as the case may be) now residing at this place.

Dated at the city of this day of

R. S.
T. L.

It is proposed, that the certificate of the consignee, at the foreign port of delivery, be executed pursuant to the form marked (A.); or, if this form shall not be adopted, it will be necessary that the certificate should particularly set forth and describe the marks, numbers, packages, and quantities, or

amount of the goods or merchandise, so consigned; the time when landed or delivered; the denomination and name of the vessel; the port to which she belongs, and the name of the master; also, the time when, the port or place where, and the person by whom shipped or consigned, and that the person certifying the same is, in fact, the consignee.

The oath or affirmation of the master and mate, if living, or, in case of their death, of the two principal surviving officers of the vessel, may be taken according to the form marked (B.), before the consul or agent of the United States residing at the port of delivery; or, if there be no consul or agent of the United States residing there, before the chief civil magistrate of the place; but, in cases where this cannot be done without incurring considerable expense and inconvenience, the oath or affirmation may, on the return of the vessel, be taken before a collector of the customs for any district of the United States, or before any other person duly qualified to administer oaths within the same.

With respect to the form marked (C.) and (D.) it is only necessary to observe, that, in all cases when merchandise entitled to a drawback or allowance shall be exported, and consigned to the master or supercargo of the vessel in which the exportation is made, or to any other person whose reputation may not be well known at the place of destination, it will merit the attention of the exporter to consider the expediency of instructing such consignee, to communicate seasonable information to the consul or agent of the United States, or to the American or foreign merchants, residing at the port of delivery, as the case may be, in order to obtain from him or them a confirmation of the facts required to be stated in the consignee's certificate, by the declaration prescribed in the act before recited.

Coins of the United States, as established by law.

GOLD COINS.

	Dolls.		Grains of fine gold.		Grains of standard ditto.
Eagles, value each	10	containing	247 4-8	or	270
Half Eagles	5		123 6-8		135
Quarter Eagles	2½		61 7-8		67½

SILVER COINS

		Grains of pure silver.		Grains of standard ditto.
Dollars	containing	371 4-16	or	416
Half Dollars		185 10-16		208
Qarter Dollars		92 13-16		104
Dimes		37 2-16		41 3-5
Half Dimes		18 9-16		0 4-5

COPPER COINS.

Cents, value each	100th doll.	containing	208	grains of
Half cent	200th doll.		104	copper.

Mills.	Cents.	Dimes.	Dolls.	Eagle.
10 equal	1			
100 equal	10 equal	1		
1000 equal	100 equal	10 equal	1	
10000 equal	1000 equal	100 equal	10 equal	1

Four different currencies, or rates, at which any one species of coin, of the same value, is reckoned in the denominations of account, have perhaps, from the first settlement of America, been, and still continue to be, used in different parts of the union. In the New England States, viz. New Hampshire, Massachusetts, including the district of Maine, Rhode Island, and Connecticut; in Vermont, Virginia, and Kentucky, the dollar is received at six shillings; in New York and North Carolina, at eight shillings; in New Jersey, Pennsylvania, Delaware and Maryland, at seven shillings and six pence; and in South Carolina and Georgia, at four shillings and eight pence.

Conceiving that, in an extensive and commercial nation, the trade and intercourse of one extremity with another will frequently render it necessary to reduce the currency of one to that of the other, we have framed the following

Rules for reducing the Currencies of the different States to a par with each other; as also for reducing the money of account of the United States to those currencies, and, vice versa, *by decimals.*

1. To reduce New England, &c. to New York and North Carolina currency, to any given sum add its third part; and, *vice versa*, subtract a fourth part.

2. To reduce New England, &c. to New Jersey, &c. currency, add to any given sum its fourth part; and, *vice versa*, subtract a fifth part.

3. To reduce New England, &c. to South Carolina and Georgia currency, as 8 to 7; and, *vice versa*, as 7 to 8; so is the one currency to the other.

4. To reduce New York and North Carolina to New Jersey, &c. currency; as 16 to 15; and, *vice versa*, as 15 to 16: so is the one to the other.

5. To reduce New York and North Carolina to South Carolina and Georgia currency, as 12 to 7; and, *vice versa*, as 7 to 12; so is the one to the other.

6. To reduce New Jersey, &c. to South Carolina and Georgia currency; as 45 to 28; and, *vice versa*, as 28 to 45, so is the one to the other.

7. To reduce any of the above currencies to the money of account of the United States, let the inferior denominations, if any, in the given sum, be annexed to the pounds in decimals, and divide, if the rate of the dollar be six shillings, by 3; if eight shillings, by 4; if seven shillings and six pence, by 3.75; if four shillings and eight pence, by 2.3; and, pointing off the decimal according to rule, the figures to the left will be dollars, those to the right decimals of a dollar, or dimes, cents, and mills. And to reduce the money of account of the United States of either of the aforesaid currencies, multiply respectively by the decimals, by which, in the former case, it was directed to divide, and the product will be pounds and decimals of a pound.

Table shewing the Number of Cents, and Decimal Parts of Cents (or Mills,) in any Number of Shillings and Pence, less than a Dollar, in the Currencies of the dfferent States.

Shillings and pence currency.		New-England, Vermont, Virginia and Kentucky.	New York and North Carolina.	New Jersey, Pennsylvania, Delaware and Maryland.	South Carolina and Georgia.	Shillings and pence currency.		New-England, Vermont, Virginia and Kentucky.	New York and North Carolina.	New Jersey, Pennsylvania, Delaware and Maryland.	South Carolina and Georgia.
s.	d.	cents.	cents.	cents.	cents.	s.	d.	cents.	cents.	cents.	cents.
0	1	1,38	1,04	1,11	1,78	4	1	68,05	51,04	54,44	87,50
0	2	2,77	2,08	2,22	3,57	4	2	69,44	52,08	55,55	89,28
0	3	4,16	3,12	3,33	5,35	4	3	70,83	53,12	56,66	91,07
0	4	5,55	4,16	4,44	7,14	4	4	72,22	54,16	57,77	92,85
0	5	6,74	5,20	5,55	8,92	4	5	73,61	55,20	58,88	94,64
0	6	8,53	6,24	6,66	10,71	4	6	75,00	56,24	60,00	96,42
0	7	9,72	7,28	7,77	12,50	4	7	76,38	57,28	61,11	98,21
0	8	11,11	8,32	8,88	14,28	4	8	77,77	58,32	62,22	100,00
0	9	12,50	9,37	10,00	16,07	4	9	79,16	59,37	63,33	
0	10	13,88	10,41	11,11	17,85	4	10	80,55	60,41	64,44	
0	11	15,27	11,45	12,22	19,64	4	11	81,94	61,45	65,55	
1	0	16,66	12,50	13,33	21,42	5	0	83,33	62,50	66,66	
1	1	18,05	13,54	14,44	23,21	5	1	84,72	63,54	67,77	
1	2	19,44	14,58	15,55	25,00	5	2	86,11	64,58	68,88	
1	3	20,83	15,62	16,66	26,78	5	3	87,50	65,62	70,00	
1	4	22,22	16,66	17,77	28,57	5	4	88,88	66,66	71,11	
1	5	23,61	17,70	18,88	30,35	5	5	90,27	67,70	72,22	
1	6	25,00	18,75	20,00	32,14	5	6	91,66	68,75	73,33	
1	7	26,38	19,79	21,11	33,92	5	7	93,05	69,79	74,44	
1	8	27,77	20,83	22,22	35,71	5	8	94,44	70,83	75,55	
1	9	29,16	21,87	23,33	37,50	5	9	95,83	71,87	76,66	
1	10	30,55	22,91	24,44	39,28	5	10	97,22	72,91	77,77	
1	11	31,94	23,95	25,55	41,07	5	11	98,61	73,95	78,88	
2	0	33,33	25,00	26,66	42,85	6	0	100,00	75,00	80,00	
2	1	34,72	26,04	27,77	44,64	6	1	—	76,04	81,11	
2	2	36,11	27,08	28,88	46,42	6	2	—	77,08	82,22	
2	3	37,50	28,12	30,00	48,22	6	3	—	78,12	83,33	
2	4	38,88	29,16	31,11	50,00	6	4	—	79,16	84,44	
2	5	40,27	30,20	32,22	51,78	6	5	—	80,20	85,55	
2	6	41,66	31,24	33,33	53,57	6	6	—	81,24	86,66	
2	7	43,05	32,28	34,44	55,35	6	7	—	82,28	87,77	
2	8	44,44	33,32	35,55	57,14	6	8	—	83,32	88,88	
2	9	45,83	34,37	36,66	58,92	6	9	—	84,37	90,00	
2	10	47,22	35,41	37,77	60,71	6	10	—	85,41	91,11	
2	11	48,61	36,45	38,88	62,50	6	11	—	86,45	92,22	
3	0	50,00	37,50	40,00	64,28	7	0	—	87,50	93,33	
3	1	51,38	38,54	41,11	66,07	7	1	—	88,54	94,44	
3	2	52,77	39,58	42,22	67,85	7	2	—	89,58	95,55	
3	3	54,16	40,62	43,33	69,64	7	3	—	90,62	96,66	
3	4	55,55	41,66	44,44	71,42	7	4	—	91,66	97,77	
3	5	56,94	42,70	45,55	74,21	7	5	—	92,70	98,88	
3	6	58,33	43,75	46,66	75,00	7	6	—	93,75	100,00	
3	7	59,72	44,79	47,77	76,78	7	7	—	94,79		
3	8	61,11	45,83	48,88	78,57	7	8	—	95,83		
3	9	62,50	46,87	50,00	80,35	7	9	—	96,87		
3	10	63,88	47,91	51,11	82,14	7	10	—	97,91		
3	11	65,27	48,95	52,22	83,92	7	11	—	98,95		
4	0	66,66	50,00	53,33	85,71	8	0		100,00		

Table showing the Value of Dollars, from 1 to 10,000, in the Currencies of the different States.

Dollars.	New England, Vermont, Virginia and Kentucky.		New York and North Carolina.		New Jersey, Pennsylvania, Delaware and Maryland.			South Carolina and Georgia.		
	l.	*s.*	*l.*	*s.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
1	0	6	0	8	0	7	6	0	4	8
2	0	12	0	16	0	15	0	0	9	4
3	0	18	1	4	1	2	6	0	14	0
4	1	4	1	12	1	10	0	0	18	8
5	1	10	2	0	1	17	6	1	3	4
6	1	16	2	8	2	5	0	1	8	0
7	2	2	2	16	2	12	6	1	12	8
8	2	8	3	4	3	0	0	1	17	4
9	2	14	3	12	3	7	6	2	2	0
10	3	0	4	0	3	15	0	2	6	8
11	3	6	4	8	4	2	6	2	11	4
12	3	12	4	16	4	10	0	2	16	0
13	3	18	5	4	4	17	6	3	0	8
14	4	4	5	12	5	5	0	3	5	4
15	4	10	6	0	5	12	6	3	10	0
16	4	16	6	8	6	0	0	3	14	8
17	5	2	6	16	6	7	6	3	19	4
18	5	8	7	4	6	15	0	4	4	0
19	5	14	7	12	7	2	6	4	8	8
20	6	0	8	0	7	10	0	4	13	4
21	6	6	8	8	7	17	6	4	18	0
22	6	12	8	16	8	5	0	5	2	8
23	6	18	9	4	8	12	6	5	7	4
24	7	4	9	12	9	0	0	5	12	0
25	7	10	10	0	9	7	6	5	16	8
26	7	16	10	8	9	15	0	6	1	4
27	8	2	10	16	10	2	6	6	6	0
28	8	8	11	4	10	10	0	6	10	8
29	8	14	11	12	10	17	6	6	15	4
30	9	0	12	0	11	5	0	7	0	0
31	9	6	12	8	11	12	6	7	4	8
32	9	12	12	16	12	0	0	7	9	4
33	9	18	13	4	12	7	6	7	14	0
34	10	4	13	12	12	15	0	7	18	8
35	10	10	14	0	13	2	6	8	3	4
36	10	16	14	8	13	10	0	8	8	0
37	11	2	14	16	13	17	6	8	12	8
38	11	8	15	4	14	5	0	8	17	4
39	11	14	15	12	14	12	6	9	2	0
40	12	0	16	0	15	0	0	9	6	8
41	12	6	16	8	15	7	6	9	11	4
42	12	12	16	16	15	15	0	9	16	0
43	12	18	17	4	16	2	6	10	0	8
44	13	4	17	12	16	10	0	10	5	4
45	13	10	18	0	16	17	6	10	10	0
46	13	16	18	8	17	5	0	10	14	8
47	14	2	18	16	17	12	6	10	19	4
48	14	8	19	4	18	00	0	11	4	0
49	14	14	19	12	18	7	6	11	8	8
50	15	0	20	0	18	15	0	11	13	4
60	18	0	24	0	22	10	0	14	0	0
70	21	0	28	0	26	5	0	16	6	8
80	24	0	32	0	30	0	0	18	13	4
90	27	0	36	0	33	15	0	21	0	0
100	30	0	40	0	37	10	0	23	6	8
200	60	0	80	0	75	0	0	46	13	4
300	90	0	120	0	112	0	0	70	0	0
400	120	0	160	0	150	0	0	93	6	8
500	150	0	200	0	187	10	0	116	13	4
900	270	0	360	0	337	10	0	210	0	0
1,000	300	0	400	0	375	0	0	233	6	8
2,000	600	0	800	0	750	0	0	466	13	4
3,000	900	0	1,200	0	1,125	0	0	700	0	0
4,000	1,200	0	1,600	0	1,500	0	0	933	6	8
5,000	1,500	0	2,000	0	1,875	0	0	1,166	13	4
9,000	2,700	0	3,600	0	2,375	0	0	2,100	0	0
10,000	3,000	0	4,000	0	3,750	0	0	2,333	6	8

	Cents.		*Cents.*
One Dollar, is - - -	**100**	**One Crown, is** - - - -	**110**
One half, do. - - -	**50**	**One half do.** - - - -	**55**
One quarter do. - -	**25**	**One Pistareen,** - - - -	**20**
One eighth do. - - -	**12½**	**One half do.** - -	**10**
One sixteenth do. - -	**6¼**		

TABLE OF THE VALUE AND WEIGHT OF COINS,

As they pass in the respective States of the Union, with their Sterling and Federal Value.

NAMES OF COINS.	Standard Weight.		Sterling money of Gt. Britain.			New Hampshire, Massachusetts. Rhode Island. Connecticut, and Virginia.			New York and North Carolina.			New Jersey, Pennsylvania, Delaware, and Maryland.			South Carolina and Georgia.			Federal value.				
																		Eagles.	Dollars.	Dimes.	Cents.	Mills.
	dwts.	grs.	£	s.	d.	£	s.	d.	£	s	d.	£	s.	d.	£	s.	d.					
An English Guinea,	5	8	1	1	0	1	8	0	1	17	0	1	15	0	1	1	9	0	4	6	6	7
A French Guinea,	5	5	1	0	0	1	7	6	1	16	0	1	14	6	1	1	5	0	4	6	0	0
A Johannes,	18	0	3	12	0	4	16	0	6	8	0	6	0	0	4	0	0	1	6	0	0	0
A Half Johannes,	9	0	1	16	0	2	8	0	3	4	0	3	0	0	2	0	0	0	8	0	0	0
A Moidore,	6	18	1	7	0	1	16	0	2	8	0	2	5	0	1	8	0	0	6	0	0	0
A Doubloon,	16	21	3	6	0	4	8	0	5	16	0	5	12	6	3	10	0	1	4	9	3	3
A Spanish Pistole,	4	6	0	16	0	1	2	0	1	9	0	1	8	0	0	18	0	0	3	7	7	3
A French Pistole,	4	4	0	16	0	1	2	0	1	8	0	1	7	6	0	17	6	0	3	6	6	7
A French Crown,	19	0	0	5	6	0	6	8	0	8	9	0	8	4	0	5	0	0	1	1	1	0
A Dollar of Spain,	17	6	0	4	6	0	6	0	0	8	0	0	7	6	0	4	8	0	1	0	0	0
An English Shilling,	3	18	0	1	0	0	1	4	0	1	9	0	1	8	0	1	0	0	0	2	2	2
A Pistareen,	3	11	0	0	10$\frac{3}{4}$	0	1	2	0	1	7	0	1	6	0	0	11	0	0	2	0	0

All other gold and silver coins, of equal fineness are valued by weight.

SIGNALS

To be made for the information of Merchant Ships, at the several stations where Signal Posts are erected, on the Coasts of Great Britain.

A pendent at the mast-head, with a flag at the yard-arm, and one ball above the flag.	An enemy's frigate or frigates.
Ditto, and two balls above the flag.	The enemy's small cruisers.
Ditto, and three balls above the flag.	An enemy's ship or vessel close under the land.

N. B. No signals made at the signal posts, but those above mentioned, are to be attended to by merchant vessels.

TABLES

OF THE

REAL AND IMAGINARY MONIES OF THE WORLD.

MONEY is either *real* or *imaginary*. Real money includes all coins, whether of gold, silver, copper, or the like; such as guineas, pistoles, or ducats, &c. &c. Imaginary money, or money of account, is that which never existed, or at least which does not exist in real specie, but is a denomination invented or retained to facilitate the stating of accounts, by keeping them still on a permanent basis, not to be changed like currency, which the authority of the sovereign sometimes raises or depresses according to the exigencies of the state; of this kind are pounds, livres, marks, &c.

With regard to the imaginary or *nominal* monies hereafter quoted, their *actual* value in *British sterling* is placed opposite to them, uninfluenced by the fluctuations, which are the result of a favourable or unfavourable state of commercial exchange between one country and another; and it is therefore to be remembered, in perusing the following tables, that, in bill transactions, where, for example, a sum of money is to be remitted to, or received from, a foreign country, the said sum must not be calculated according to the actual value of the currency, but by the course of exchange of the day.

We think it necessary to observe, that, formerly in Scotland, there was a currency peculiar to that country, which, of late years, being entirely done away, we have not noticed; the same may be said of Holland, &c.

MONIES OF GREAT BRITAIN.

	l.	*s.*	*d*
Imaginary Money.			
Pound	0	20	0
Real Money.			
GOLD.			
Carolus, or Laureate (obsolete)	1	10	0
Jacobus (obsolete)	1	5	0
Guinea	1	1	0
Half Guinea	0	10	6
Seven Shilling Piece	0	7	0
SILVER.			
Dollar (*Bank Token*)	0	5	6

	l.	s.	d.
Crown	0	5	0
Bank Token	0	3	0
Half Crown	0	2	6
Bank Token	0	1	6
Shilling	0	0	12
Sixpence	0	0	6
COPPER.			
Two-pence	0	0	2
Penny	0	0	1
Halfpenny	0	0	$0\frac{1}{2}$
Farthing	0	0	$0\frac{1}{4}$

IRELAND.

Imaginary Money as in England.

Real Money.

	l.	s.	d.
GOLD.			
Guinea	1	2	9
SILVER.			
Shilling	0	1	1
Sixpence	0	0	$6\frac{1}{2}$

And so of the rest.

EAST INDIES.

Imaginary Money.

	l.	s.	d.
Budgrook	0	0	$0\frac{27}{800}$
Ree	0	0	$0\frac{27}{400}$

Real Money.

	l.	s.	d.
GOLD.			
Rupee, at Goa, Malabar Coast, &c.	1	16	0
Do. at Guzerat, Surat, &c.	1	15	0
Do. at Bombay, &c.	1	13	9
Paru	0	18	0
Pagoda, at Madras, Coromandel, &c.	0	9	0
Do. at Bombay, &c.	0	7	$10\frac{1}{2}$
Do. at Bengal, Calcutta, &c.	0	8	9
SILVER.			
English Crown	0	5	0
French Ecu	0	5	0
Rial	0	5	0
Tangu	0	4	6
Dollar	0	4	6
Rupee, at Bengal, &c.	0	2	6
Do. at Bombay, Daboul, &c.	0	2	3
Fiano	0	1	$6\frac{3}{4}$
Xeraphim	0	1	$4\frac{1}{8}$
Futal	0	2	6
Sooco	0	1	3
Fanam, at Madras, Pondicherry, &c.	0	0	3
Do. at Guzerat, Cambay, &c.	0	0	$1\frac{7}{8}$
Pical	0	0	$2\frac{1}{4}$
Ana, at Guzerat, &c.	0	0	$7\frac{1}{2}$
Do. at Bengal, Calicut, &c.	0	0	$1\frac{7}{8}$
Quarter	0	0	$6\frac{3}{4}$
Viz	0	0	$2\frac{11}{32}$
Vintin	0	0	$1\frac{7}{20}$
Laroe	0	0	$5\frac{2}{5}$
Sataleer	0	0	$7\frac{1}{2}$
COPPER.			
Pice, at Bengal, Calcutta, &c.	0	0	$0\frac{5}{32}$
Do. at Bombay and Malabar Coast	0	0	$0\frac{27}{80}$
Do. at Madras, Coromandel Coast	0	0	$0\frac{3}{8}$
Do. at Guzerat, Cambay, &c.	0	0	$0\frac{15}{32}$
Fanam	0	0	$0\frac{5}{8}$
Viz, at Bengal, Calcutta, &c.	0	0	$0\frac{15}{16}$
Do. at Madras, Pondicherry, &c.	0	0	$0\frac{3}{16}$
Cash	0	0	$0\frac{3}{80}$
Pecka, at Goa, Visiapour, &c.	0	0	$0\frac{27}{100}$
Do. at Guzerat, &c.	0	0	$0\frac{15}{64}$
Fettee	0	0	$0\frac{3}{50}$
Cori	0	0	$0\frac{3}{500}$

BRITISH WEST INDIES.

Imaginary Money.

	l.	s.	d.
Pound	0	14	3
Shilling	0	0	$8\frac{11}{20}$
Penny	0	0	$0\frac{57}{80}$
Halfpenny	0	0	$0\frac{57}{160}$

Real Money.

	l.	s.	d.
GOLD.			
Guinea	1	1	0
Pistole	0	16	9

	l.	s.	d.
SILVER.			
Crown	0	5	0
Dollar	0	4	6
Bit	0	0	$5\frac{3}{8}$

UNITED STATES OF AMERICA.

Real Money.

	l.	s.	d.
GOLD.			
Eagle	2	4	0
Half Eagle	1	2	0
Quarter Eagle	0	11	0
SILVER.			
Dollar, in Georgia and South Carolina	0	4	8
Do. in N. England and Virginia	0	6	0
Do. in Delaware, Maryland, New Jersey and Pennsylvania	0	7	6
Do. at New York and North Carolina	0	8	0
Half Dollar, Quarter Dollar: In each state proportionable to the value in which the dollar is held.			

Dime, equal to the tenth part of a dollar's value.

Half Dime, do. twentieth do.

COPPER.

Cent, equal to the hundredth part of a dollar.

A complete description of the coins of the American States, with tables of the currencies, and of the value and weight of various coins, as they pass in the respective states of the union, are annexed to the *Tables of American Duties,* given heretofore.

FRANCE.

Imaginary Money.

	l.	s.	d.
Livre	0	0	10
Franc	0	0	10
Decime	0	0	1
Centime	0	0	$0\frac{1}{10}$
Florin	0	1	$0\frac{1}{4}$
Do.	0	1	6
Do.	0	0	$4\frac{1}{4}$
Pistole	0	8	4
Piette, at Dunkirk, &c.	0	0	$7\frac{1}{2}$
Do. at Lisle, &c.	0	0	$9\frac{3}{4}$

Real Money.

	l.	s.	d.
GOLD.			
Louis d'Or	1	0	0
Guinea	1	1	0
Moidore	1	7	0
SILVER.			
Ducat at Lisle	0	8	9
Do. at Brussels	0	9	
Six Livre Piece	0	5	0
Ecu	0	5	0
Five Franc Piece	0	4	2
Three Livre do.	0	2	6
Thirty Sol do.	0	1	3
Twenty four Sol do.	0	1	0
Fifteen Sol. do.	0	0	$7\frac{1}{2}$
Twelve Sol do.	0	0	6
Six Sol do.	0	0	3
COPPER.			
Double Sol Piece	0	0	1
Six Liard do.	0	0	$0\frac{3}{4}$
Sol	0	0	$0\frac{1}{2}$
Two Liard	0	0	$0\frac{1}{4}$
Liard	0	0	$0\frac{1}{8}$
Denier	0	0	$0\frac{1}{24}$
Do. at Geneva	0	0	$0\frac{1}{32}$
Dardene	0	0	$0\frac{1}{4}$

THE NEW MONIES OF FRANCE.

The Franc may be considered as the unity of the new French coins; it is nearly the same with the livre tournois,* and worth about ten pence English. Francs and livres were formerly similar; but, in one coinage, the five livre pieces were, by accident, made too heavy, being worth 101¼ sols instead

* The word *tournois* is used by the French as we employ *sterling*.

of 100; the new franc has been therefore adopted in conformity with this value, and the franc or new livre is equal to 213 deniers, being $1\frac{1}{2}$ per cent. better than the old livre tournois, equal 210 deniers.

By a decree, which passed the French legislative body on the 30th of March, 1803, for a new coinage, the silver pieces were appointed to be quarter francs, half francs, three quarter francs, two franc pieces, and five franc pieces. The gold coinage to be twenty and forty franc pieces. The copper pieces to be those of two hundredths, three hundredths, and five hundredths of a franc. The gold and silver coins are of nine tenths pure and one tenth alloy.

	English value.		
	l.	*s.*	*d.*
GOLD COINS.			
Forty Francs	1	13	9
Twenty Francs	0	16	$10\frac{1}{2}$
SILVER.			
Five Francs	0	4	2
Two Francs	0	1	$8\frac{1}{4}$
One Franc	0	0	$10\frac{1}{8}$
$\frac{3}{4}$ of a Franc	0	0	$7\frac{19}{32}$
$\frac{1}{2}$ of a Franc	0	0	$5\frac{1}{16}$
$\frac{1}{4}$ of a Franc	0	0	$2\frac{17}{32}$
COPPER.			
Two decimes one fifth of a Franc	0	0	$2\frac{1}{40}$
A decime one tenth of a Franc	0	0	$1\frac{1}{80}$
A Sol, or five Centimes	0	0	$0\frac{81}{160}$
Three Centimes	0	0	$0\frac{243}{800}$
Two Centimes, one fifth of a Decime and one fiftieth of a Franc	0	0	$0\frac{81}{400}$
A Centime, one tenth of a Decime and one tenth of a Franc	0	0	$0\frac{81}{800}$

FRENCH WEST INDIES.

Imaginary Money.

	l.	*s.*	*d.*
Livre	0	0	$7\frac{5}{16}$
Half Sol	0	0	$0\frac{117}{640}$

Real Money.

GOLD.			
Louis d'Or	1	0	0
Pistole	0	16	9
SILVER.			
Ecu	0	4	$10\frac{1}{2}$
Dollar	0	4	6
Scalin	0	0	$5\frac{3}{8}$
Half Scalin	0	0	$2\frac{11}{16}$
COPPER.			
Sol	0	0	$0\frac{117}{320}$

NETHERLANDS.

Imaginary Money.

Pound, Flemish	0	9	0
Florin	0	1	6
Scalin	0	0	$5\frac{2}{5}$
Grote	0	0	$0\frac{9}{20}$

Real Money.

GOLD.			
Ducat	0	9	3
SILVER.			
Scalin	0	0	$6\frac{3}{10}$
COPPER.			
Petard	0	0	$0\frac{9}{10}$
Urche	0	0	$0\frac{9}{40}$
Penning	0	0	$0\frac{9}{160}$

HOLLAND.

Imaginary Money.

Flemish Pound	0	10	6
Penning	0	0	$0\frac{21}{320}$

Real Money.

GOLD.			
Reyer	1	4	6
Half Reyer	0	12	3
Ducatoon	0	7	6
Florin	0	2	$5\frac{1}{10}$
SILVER.			
Rix Dollar	0	4	$4\frac{1}{10}$
Dry Guilder	0	5	3
Guilder	0	1	9

	l.	s.	d.
Schilling	0	0	$6\frac{3}{10}$
Stiver	0	0	$1\frac{1}{20}$

COPPER.

	l.	s.	d.
Grote	0	0	$0\frac{21}{40}$

POLAND AND RUSSIA.

Imaginary Money.

	l.	s.	d.
Rix Dollar	0	3	6
Ducat	0	9	4

Real Money.

GOLD.

	l.	s.	d.
Golden Frederic	0	17	6

SILVER.

	l.	s.	d.
Florin	0	1	2
Ort	0	0	$8\frac{2}{5}$
Tinse	0	0	7
Coustic	0	0	$2\frac{1}{3}$

COPPER.

	l.	s.	d.
Grosh	0	0	$0\frac{7}{15}$
Shelon	0	0	$0\frac{7}{45}$

SWITZERLAND.

Imaginary Money.

	l.	s.	d.
Livre at St. Gall, Appenzel, &c.	0	2	6
Do. at Berne, Neufchatel, &c.	0	2	0
Sol Do.	0	0	$1\frac{1}{5}$
Do. St. Gall, do.	0	0	$0\frac{1}{3}$

Real Money.

SILVER.

	l.	s.	d.
Crown	0	4	6
Rix Dollar at Basle, Zurich, &c.	0	4	6
Do. at St. Gall, &c.	0	4	3
Gulden	0	2	6
Gould	0	2	6
Fine Batzen, at St. Gall, &c.	0	0	$2\frac{1}{2}$
Fine Batzen, at Basle,	0	0	$2\frac{1}{4}$
Coarse Batzen, at St. Gall, &c.	0	0	2
Do. at Basle, &c.	0	0	$1\frac{7}{8}$
Batzen	0	0	$2\frac{2}{5}$
Gros	0	0	2
Plapert	0	0	$1\frac{3}{5}$

COPPER.

	l.	s.	d.
Creutzer at St. Gall	0	0	$0\frac{1}{2}$
Creutzer at Berne, &c.	0	0	$0\frac{2}{5}$
Fening	0	0	$0\frac{1}{8}$
Heller	0	0	$0\frac{1}{16}$
Denier	0	0	$0\frac{1}{10}$
Rapen	0	0	$0\frac{1}{24}$

GERMANY.

Imaginary Money.

	l.	s.	d.
Flemish Pound	0	11	3
Rix Dollar	0	3	6
Marc, at Hamburg, Bremen, &c.	0	1	6
Do. at Berlin, Stettin, &c.	0	0	$9\frac{1}{3}$
Fenning, at Hanover, Zell, &c.	0	0	$0\frac{7}{48}$
Do. at Frankfort, Nuremberg, &c.	0	0	$7\frac{7}{66}$
Heller	0	0	$0\frac{7}{96}$
Sexling	0	0	$0\frac{3}{64}$
Denier	0	0	$0\frac{7}{270}$
Tryling	0	0	$0\frac{9}{128}$

Real Money.

GOLD.

	l.	s.	d.
Ducat, at Hamburg, Lubec, &c.	0	9	$4\frac{1}{8}$
Do. at Frankfort, Dettingen, &c.	0	9	4

SILVER.

	l.	s.	d.
Hard Dollar	0	4	8
Rix Dollar	0	4	6
Slet Dollar	0	3	0
Double Guelden	0	4	8
Guelden	0	2	4
Half Guelden	0	1	2
Albertus	0	4	2
Gould	0	2	4
Florin	0	1	2
Copstuck	0	0	$8\frac{4}{5}$
Ort Gould	0	0	7
Guilder	0	2	4
Groshen	0	0	$1\frac{3}{4}$
Grosh	0	0	$0\frac{19}{36}$
Batzen	0	0	$1\frac{13}{15}$
Shilling Lub	0	0	$1\frac{1}{8}$
Plapert	0	0	$2\frac{1}{16}$
Stiver	0	0	$0\frac{7}{10}$

	l.	s.	d.
COPPER.			
Marien	0	0	$1\frac{1}{6}$
Abras	0	0	$0\frac{7}{10}$
Groshen	0	0	$0\frac{7}{15}$
Polchen	0	0	$0\frac{7}{30}$
Creutzer, at Frankfort, &c.	0	0	$0\frac{7}{15}$
Do. at Cologne, Liege, &c.	0	0	$0\frac{21}{80}$
Fenning	0	0	$0\frac{7}{18}$
Dreyer, at Prague, Hungary, &c.	0	0	$0\frac{3}{30}$
Do. at Dresden, Leipsic, &c.	0	0	$0\frac{7}{16}$
Do. at Vienna, Augsburg, &c.	0	0	$0\frac{7}{30}$
Grosh	0	0	$0\frac{7}{90}$
White Grosh	0	0	$6\frac{14}{15}$
Phening	0	0	$0\frac{3}{32}$
Dutes	0	0	$0\frac{7}{18}$
Albus	0	0	$0\frac{21}{40}$
Keyser Gross	0	0	$0\frac{9}{10}$

SWEDEN AND LAPLAND.

Imaginary Money.

	l.	s.	d.
Runstiic	0	0	$0\frac{7}{36}$

Real Money.

	l.	s.	d.
GOLD.			
Ducat	0	9	4
SILVER.			
Rix Dollar	0	4	8
Silver do.	0	1	$6\frac{2}{3}$
Caroline	0	1	2
Silver Marc	0	0	$4\frac{2}{3}$
COPPER.			
Dollar	0	0	$6\frac{2}{9}$
Marc	0	0	$1\frac{5}{9}$
Stiver	0	0	$0\frac{7}{18}$

DENMARK AND NORWAY.

Imaginary Money.

	l.	s.	d.
Crown	0	1	3
Rix Ort	0	0	$4\frac{1}{2}$
Schilling	0	0	$0\frac{1}{32}$

Real Money.

	l.	s.	d.
SILVER.			
Ducat	0	5	$10\frac{7}{8}$
Hat Ducat	0	9	0
Rix Dollar	0	3	$11\frac{1}{4}$
COPPER.			
Rix Marc	0	0	$0\frac{3}{4}$
Slet Marc	0	0	$0\frac{3}{8}$
Duggen	0	0	$0\frac{1}{15}$

RUSSIA AND MUSCOVY.

Money of Account.

	l.	s.	d.
Ruble	0	4	6
Copeck	0	0	$0\frac{27}{50}$

Real Money.

	l.	s.	d.
GOLD.			
Xervonitz	0	10	$1\frac{1}{2}$
Imperial do.	1	2	6
Double do.	2	5	0
SILVER.			
Ruble	0	4	6
Poltin or Half Ruble	0	2	3
Polpotin	0	1	$1\frac{1}{2}$
Grivener	0	0	$5\frac{2}{3}$
Piat Copeck	0	0	$2\frac{3}{5}$
COPPER.			
Five Copecks	0	0	$2\frac{35}{50}$
Two Copecks	0	0	$1\frac{4}{50}$
Copeck	0	0	$0\frac{27}{50}$
Denusca	0	0	$0\frac{27}{100}$
Polusca	0	0	$0\frac{27}{200}$

LIVONIA.

Imaginary Money.

	l.	s.	d.
Albertus	0	4	$2\frac{4}{15}$
Rix Dollar	0	3	6

Real Money.

	l.	s.	d.
SILVER.			
Florin	0	1	2
Mark	0	0	$2\frac{4}{5}$
COPPER.			
Plate Dollar	0	5	0
Whiten	0	0	$0\frac{14}{15}$
Vording	0	0	$0\frac{7}{10}$
Grosh	0	0	$0\frac{7}{15}$
Blacken	0	0	$0\frac{7}{90}$

ITALY.

Imaginary Money.

	l.	s.	d.
Ounce	0	7	$8\frac{4}{13}$
Stamped Crown	0	6	0
Ducat of Exchange, at Venice, &c.	0	4	4

	l.	s.	d.
Do. do. Naples, &c.	0	3	4
Scudi of ditto	0	4	3
Lire, at Turin, Sardinia, &c.	0	1	3
Do. at Bologna, &c.	0	1	0
Do. at Leghorn, Florence, &c.	0	0	$8\frac{1}{3}$
Do. at Genoa, Corsica, &c.	0	0	$8\frac{3}{8}$
Do. at Venice, &c.	0	0	$6\frac{2}{3}$
Do. at Milan, Parma, Modena, &c.	0	0	$8\frac{32}{41}$
Pezza	0	4	2
Florin of Exchange	0	1	$6\frac{6}{13}$
Florin	0	0	9
Gros	0	0	$2\frac{1}{8}$

Real Money.

GOLD.

	l.	s.	d.
Pistole, at Milan, &c.	0	16	0
Do. at Bologna, &c.	0	15	6
Do. at Sicily, Malta, &c.	0	15	4
Do. at Turin, Sardinia, &c.	0	16	3
Do. at Genoa, Corsica, &c.	0	14	4
Chequin, at Venice, &c.	0	9	2
Chequin at Rome, &c.	0	9	0
Genouine	0	6	$5\frac{2}{3}$
Ducat at Leghorn, &c.	0	5	$2\frac{1}{2}$
Do. Sicily, Malta, &c.	0	3	4
Piastre	0	4	2

SILVER.

	l.	s.	d.
Ducatoon	0	5	8
Crown	0	5	0
Scudi	0	4	3
Do. at Milan, Parma, &c	0	4	$2\frac{1}{2}$
Do. at Turin, &c.	0	4	6
Philip,	0	4	$4\frac{1}{8}$
Croisade	0	3	7
Ducat, at Venice, &c.	0	3	$5\frac{1}{3}$
Testoon, at Rome, Ancona, &c.	0	1	6
Do. at Naples, Capua, &c.	0	1	4
Quito	0	0	$5\frac{4}{5}$
Julio	0	0	6
Stamped do.	0	0	$7\frac{1}{3}$
Chavolet	0	0	$1\frac{13}{25}$
Carlin, at Sicily, Malta, Palermo, &c.	0	0	$1\frac{7}{13}$
Do. at Naples, &c.	0	0	4
Tarin, do.	0	0	8
Tarin at Sicily, Palermo, &c.	0	0	$3\frac{1}{13}$
Paulo	0	0	$5\frac{1}{3}$

COPPER.

	l.	s.	d.
Denari, at Milan, &c.	0	0	$3\frac{3}{82}$
Do. at Genoa, &c.	0	0	$0\frac{43}{1200}$
Do. at Leghorn, &c.	0	0	$0\frac{6}{124}$
Do. at Turin, &c.	0	0	$6\frac{1}{16}$
Quatrini, at Milan	0	0	$0\frac{9}{82}$
Do. at Leghorn, &c.	0	0	$0\frac{5}{36}$
Do. at Bologna, &c.	0	0	$0\frac{1}{10}$
Do. at Rome, &c.	0	0	$0\frac{3}{20}$
Do. at Naples	0	0	$0\frac{2}{13}$
Do. at Turin, &c.	0	0	$0\frac{3}{16}$
Soldi at Leghorn	0	0	$0\frac{5}{12}$
Do. at Venice	0	0	$0\frac{1}{3}$
Do. at Genoa	0	0	$0\frac{43}{100}$
Do. at Turin	0	0	$0\frac{3}{4}$
Do. at Milan	0	0	$0\frac{13}{41}$
Picoli	0	0	$0\frac{1}{39}$
Grain	0	0	$0\frac{3}{13}$
Pouli	0	0	$0\frac{8}{39}$
Bayoc, at Rome, Civita Vecchia	0	0	$0\frac{3}{4}$
Bayoc at Bologna, Ravenna, &c.	0	0	$0\frac{3}{8}$

Imaginary Money.

	l.	s.	d.
Pistole	0	14	4
Ducat at Barcelona, Saragossa, &c.	0	6	$2\frac{1}{4}$
Do. do.	0	6	9
Do. do.	0	5	$10\frac{7}{8}$
Do. at Madrid, Cadiz, &c.	0	4	$11\frac{1}{8}$

	l.	s.	d.
Piastre	0	3	7
Maravedie	0	0	0$\frac{23}{272}$
*Rial Vellon	0	0	2$\frac{7}{8}$

Real Money.

GOLD.

Piece of four Pistoles	3	7	3
Double Pistole	1	13	7$\frac{1}{2}$
Pistole	0	16	9

SILVER.

Dollar	0	4	6
Piastre	0	3	7
Piastrine	0	0	10$\frac{3}{4}$
Rial, at Barcelona, Saragossa, &c.	0	0	6$\frac{3}{4}$
Do. Madrid, Cadiz, &c.	0	0	5$\frac{3}{8}$
Soldo	0	0	3$\frac{3}{8}$

COPPER.

Quartil, at Gibraltar	0	0	0$\frac{23}{68}$
Do. at Madrid, &c.	0	0	0$\frac{43}{136}$
Maravedie, at Madrid	0	0	0$\frac{23}{272}$
Do. at Barcelona	0	0	0$\frac{27}{500}$

It must be observed that, in Spain, they have new money and old: the old, current in Seville, Cadiz, Andalusia, &c. is worth 25*l.* per cent. more than the new, current at Madrid, Bilboa, &c. This difference is owing to their king Charles II. who, to prevent the exportation of money, raised it 25*l.* per cent. which, however, he was only able to effect in part, several provinces still retaining the ancient rate.

PORTUGAL.

Imaginary Money.

	l.	s.	d.
Crusada	0	0	10
Testoon	0	0	7$\frac{1}{2}$
Vintim	0	0	0$\frac{3}{4}$

Real Money.

GOLD.

Joanese	1	7	0
Moidore	1	1	0
Milrea	1	0	0

SILVER.

New Crusada	0	2	6

COPPER.

Vintim	0	0	0$\frac{1}{2}$
Rea, Rez, or Reis	0	0	0$\frac{1}{24}$

TURKEY.

Imaginary Money.

	l.	s.	d.
Asper	0	0	0$\frac{3}{5}$
Piastre	0	4	0

Real Money.

GOLD.

Xeriff	0	10	0

SILVER.

Caragrouch	0	5	0
Solota	0	1	0
Ostic	0	0	6
Bestic	0	0	3
Parea	0	0	1$\frac{1}{5}$

COPPER.

Mangou	0	0	0$\frac{3}{20}$

ARABIA.

Imaginary Money.

	l.	s.	d.
Tomond	3	7	6
Piastre	0	4	6

Real Money.

SILVER.

Sequin	0	7	6
Dollar	0	4	6
Abyss	0	1	4$\frac{1}{5}$
Larin	0	0	10$\frac{1}{8}$

COPPER.

Comashee	0	0	0$\frac{9}{10}$
Caveer	0	0	0$\frac{27}{40}$
Carret	0	0	0$\frac{1}{8}$

PERSIA.

Imaginary Money.

	l.	s.	d.
Tomond	3	6	8

Real Money.

GOLD.

Bovello	0	16	0
Or	0	6	8

* Rial Vellon is five cents, twenty of which make a dollar.

	l.	s.	d.
SILVER.			
Abashee	0	1	4
Larin	0	0	10
Mamoda	0	0	8
Shahee	0	0	4
COPPER.			
Bisti	0	0	$1\frac{3}{5}$
Cos	0	0	$0\frac{2}{5}$

EGYPT.

Imaginary Money.

	l.	s.	d.
Pargo Dollar	0	10	6
Piastre	0	4	0

Real Money.

	l.	s.	d.
GOLD.			
Sultanin	0	10	0
SILVER.			
Crown	0	5	0
Ecu	0	5	0
Dollar	0	4	6
Italian Ducat	0	3	4
Medin	0	0	$1\frac{2}{3}$
COPPER.			
Asper	0	0	$0\frac{5}{9}$

BARBARY.

Real Money.

	l.	s.	d.
GOLD.			
Pistole	0	16	$10\frac{1}{2}$
Chequin	0	8	4
SILVER.			
Dollar	0	4	2
Chequin	0	3	4
Dollar	0	4	6
Double	0	1	$1\frac{1}{2}$
Rial (*old plate*)	0	0	$6\frac{3}{4}$
Medin	0	0	$1\frac{2}{3}$
COPPER.			
Asper	0	0	$0\frac{5}{9}$

MAROCCO.

Real Money.

	l.	s.	d.
GOLD.			
Pistole	0	16	8
Xequin	0	9	0
SILVER.			
Dollar	0	4	8
Medio	0	4	8
Quarto	0	2	4
Octavo	0	1	2
Ounce	0	0	8
Blanquil	0	0	2
COPPER.			
Fluce	0	0	$0\frac{1}{12}$

CHINA.

Imaginary Money.

	l.	s.	d.
Talc	0	6	8
Caxa	0	0	$0\frac{21}{25}$

Real Money.

	l.	s.	d.
SILVER.			
English Crown	0	5	0
French Ecu	0	5	0
Dollar	0	4	6
Rix dollar	0	4	$4\frac{1}{2}$
Rupee	0	2	6
Mace	0	0	8
COPPER.			
Candareen	0	0	$0\frac{4}{5}$

JAPAN.

Real Money.

	l.	s.	d.
GOLD.			
Cattee	65	9	6
Double	12	11	4
Japanese	6	5	8
Ounce	3	2	10
Ingot	0	9	8
SILVER.			
Talc	0	6	8
Ounce	0	4	10
Mace	0	0	4
COPPER.			
Piti	0	0	$0\frac{1}{5}$

EXCHANGES.

Exchange may be compared with barter; as it is the paying or receiving of money in one country for its equivalent in the money of another, by means of bills of exchange. Or it has been more fully defined as the reduction of different coins, or any denominations of money, from one to another: or, as the method of finding how many of one species or denomination are equal to a given number of another: in order to which it is necessary to know the value of the coins of different countries, and the proportion to each other, according to the settled rate of exchange. The several operations in this case, are only different applications of the rule of three.

The *par of exchange* is the real or intrinsic value of the different species of foreign money equalized to those of England, and *vice versa*. Thus the par between England and Ireland is $8\frac{1}{3}$ per cent. or 108*l.* 6*s.* 8*d.* Irish are equal to 100*l.* English; the English shilling being current in that country for 13*d.* consequently the pound sterling is 1*l.* 1*s.* 8*d.* Therefore when the exchange from London on Dublin is 12*l.* per cent, there is a profit or saving of 3*l.* 13*s.* 4*d.* per cent. on every 100*l.* sterling remitted to Ireland.

The *course of exchange* is the current price of a sum of money between two places. This price is constantly fluctuating, according to the circumstances of trade, or as cash or bills are more or less plentiful; and fluctuating thus, it is seldom at par, but generally either above or below it.

Usance is the usual term of bills between certain places; as, one, two, or three months after date; and double usance, treble, or half, means double treble, or half the usual time. When necessary to divide a month upon half usance, the division contains fifteen days.

Days of grace are a certain number of days exceeding the term expressed, which are generally granted before the bill is paid. The number of these days varies according to the custom of different countries. In the United Kingdom of Great Britain and Ireland, three days grace are allowed: but, if the last of three days happen upon a Sunday, the bill becomes payable on the preceding day.

In Holland there are two sorts of money, bank or banco, and

current. Bank money is generally from three to five per cent. better than currency, and bears a premium called *agio;* but it has, sometimes, in the course of the revolution, been at a discount.

Bills are usually drawn upon Holland in current money, but they are always paid in banco.

We shall illustrate this subject with some examples of the operations of direct exchange between London and other places.

Example of the London Course of Exchange.

Uncertain Prices.			Certain Prices.
Dublin *gives*	$108\frac{1}{3}$	Pounds Irish *for*	100 Pounds, British.
Amsterdam	35	Schillings Flemish .	1 Pound, sterling.
Rotterdam .	12	Florins current .	ditto.
Hamburg .	33	Schillings Flemish .	ditto.
Paris . .	24	Francs	ditto.
—— . .	24	Livres Tournois .	ditto.
Madrid *receiv.*	39	Pence sterling . .	1 Dollar of Exchange.
Lisbon . .	66	Pence sterling . .	1 Milrea.
Leghorn .	$50\frac{1}{4}$	Pence sterling . .	1 Pezza of 8 reals.
Genoa . .	49	Pence sterling . .	1 Pezza fuori di Banco.
Naples . .	39	Pence sterling . .	1 Ducat di Regno.
Venice *gives*	57	Lire Piccole . .	1 Pound sterling.

London exchanges on Dublin in pounds shillings, and pence, British sterling.

The par $8\frac{1}{3}$ per cent. or 108*l.* 6*s.* 8*d.* Irish for 100*l.* British.

Reduce 750*l.* 12 6 British sterling into Irish sterling at par.

750*l.*	12	6	
		8	
6005	0	0	
250	4	2	equal $\frac{1}{4}$.
62,55	4	2	
20			
11,04			
750*l.*	12	6	
62	11	0	
Ans. 813	3	6	Irish sterl.

Dublin exchanges on London in pounds, shillings, and pence, Irish sterling, to distinguish it from British sterling.

Reduce 813*l.* 3 6 Irish sterling into British sterling, at $8\frac{1}{3}$ per cent.

RULE.

The difference being 1*d.* in a shilling, divide the given sum by 13, thus:

	13)813	3	6
Less	62	11	3
Ans.	750*l.*	12	6 Brit. sterl.

London exchanges on Amsterdam in pounds, shillings, and pence.

Reduce 8756 guilders, 8 stivers, and 12 pennings, banco, into sterling, at 34 schillings 3 grotes banco for 1*l.* sterling.

RULE.

Multiply by 40 grotes (equal 1 guilder) and divide by the price of exchange, reduced into grotes by multiplying it by 12.

EXAMPLE.

```
                    sch. gr. £
Banc. 8756  8  12 a 34  3 per 1
       40            12
     ------        -----
    350240          411
       16 equal 8 stiv.
        1 for 12 penn.
    ------
411)350257(852
    3288
    ----
     2145
     2055
     ----
      907
      822
      ---
       85
       20
      ---
411)1700(4
    1644
    ----
      56
      12
     ---
411)672(1
    411
    ---
    261
```

Answer, 852*l.* 4 1 sterling.

Usance, 1 month after date.

From Italy, Spain, and Portugal, 2 months after date.

Days of grace, 6; but seldom demanded.

Amsterdam exchanges on London in guilders, stivers, and pennings; and in pounds Flemish, schillings, and grotes.

16 pennings = 2 grotes, or 1 stiv.
20 stivers - 1 guilder,
12 grotes - 1 schilling, and
20 schilling - 1 pound Flemish.

N. B. Bank money has been commonly better than current money: the difference is called the agio.

Reduce 852*l.* 4 1, sterling, into banco at par.

RULE.

Multiply by the price of exchange, reduced into grotes, as under, and divide by 40 grotes equal to one guilder.

EXAMPLE.

```
   852l. 4  1 sterling at
    411      34 sch. 3 gr.
    ---      per 1l. sterl.
    852
   852
  3408
      82 equal ½ for 4s.
       3½ for the fraction.
  -------
4|0)35025|7½
  --------        From above.
  8756—17½           sch. gr.
  ----   20            34 5
        ----           12
      4|0)35|0        ----
      -------          411
          8—30
          — 16
          -----
        4|0)48|0
          -----
           12
```

Answer, 8756 8 12 banco.

No days of grace are generally allowed for bills drawn in bank-money. Bills are protested on the second or third day after due.

London exchanges on Hamburg in pounds, shillings, and pence.

Reduce 4524 mark-lubs, 11 sol-subs, 6 deniers, banco, into sterling at 32 sch. 1 gr. banco, for 1*l.* sterling.

RULE.

Multiply by 32 grotes equal 1 mark-lub, and divide by the price of exchange, reduced into grotes by multiplying it by 12.

EXAMPLE.

```
                   sch. gr.  l.
Banco 4524 11 6 at 32  1  per 1.
        32             12
      ----           ----
      9048            385
     13572           ----
        22 = 11 sol-lubs.
         1 =  6 deniers.
     -----
315)144791(376
    1155
    ----
    2929
    2695
    ----
     2341
     2310
       31
        20
385)620(1
    385
    ---
    235
     12
385)2820(7
    2695
    ----
     125
```

Answer 376*l* 1 7 *sterling.*

Usance, 1 month after date.

From Italy, Spain and Portugal, 2 months after date.

Days of grace 12; Sundays, holidays, and the days when due, included.

Hamburg exchanges on London in mark-lubs, sol-lubs, and deniers, or phennings; and in pounds Flemish, schillings, and grotes.

12 deniers = 1 sol-lub or 2 grot.
16 sol-lubs - 1 mark-lub: and
12 grotes - 1 schilling.
20 schillings 1 pound Flemish.

N. B. Bank money is 16 per cent. better than current money with a sur-agio, from 6 to 12 per cent.

Reduce 376*l.* 1 7 sterling into banco at par.

RULE.

Multiply by the price of exchange reduced into grotes as above, and divide by 32 grotes, equal 1 mark-lub.

EXAMPLE.

```
   376l. 1 7 ster. at 32 sch.
   385      1 gr. per 1l. st.
   ----              32  1
   1880              12
  3008              ----
 1128               385
     19 = 1/20 for 1s.
     11 for 7d.
 -----
32)144790(4524
   128
   ---
   167
   160
   ---
    79 Brought up 22
    64            16
    --            --
   150        32)352(11
   128           32
   ---           --
    22           32
                 32
                 --
```

Answer, 4524 11 banco.

London exchanges on Paris in pounds, shillings, and pence.

Reduce 73486 livres, 18 sols, 6 deniers, into sterling, at $30\frac{7}{8}d.$ for 1 crown of 3 livres.

RULE.

Take $\frac{1}{3}$ of the given sum to reduce it into crowns, and multiply by the price of exchange, the product will be the answer in pence.

EXAMPLE.

Livres 73486 18 6 at $30\frac{7}{8}$ per écu.

$\frac{1}{3}$—24495 12 10
30

734850
$\frac{1}{2}$—12247 $\frac{4}{8}$ for $\frac{4}{8}$
$\frac{1}{4}$— 6123 $\frac{6}{8}$ for $\frac{7}{8}$
$\frac{1}{8}$— 3061 $\frac{7}{8}$ for $\frac{1}{8}$
$\frac{1}{2}$ of $30\frac{7}{8}$ 15 $\frac{3}{8}$ for 10*s.*
$\frac{1}{4}$ — 3 $\frac{7}{8}$ for 2*s.* 6*d.*
$\frac{4}{8}$ for 4*d.*

13)756302 $\frac{7}{8}$

20)6302|5 $2\frac{7}{8}$

Ans. 3151*l.* 5 $2\frac{3}{4}$ sterling.

Usance, 30 days; 2 usance, 60 days, &c. and 10 days of grace; but bills of sight, or of a fixed date, must be paid 24 hours after due.

Paris exchanges on London in livres, sols, and deniers: and also in francs and cents.

12 deniers = 1 sol.
20 sols = 1 livre Tournois.
3 livres = 1 écu.

Reduce 3151*l.* 5 $2\frac{3}{4}$ ster. into liv. Tourn. at $30\frac{7}{8}d.$ per écu.

20
63025 8
12
247
756302
8 and take in 6 for $\frac{3}{4}$

6050422
3 and take in 4 for the fraction.

247)18151270(73486
1729
861
741
1202
988
2147
1976
1710
1482
228
20
247)4560(18
247
2090
1976
114
12
247)1368(6
1482

Ans. 73486 18 6 Livres Tour.

Francs and Cents are reduced to Livres and Deniers, by multiplying by 81 and dividing by 80; and Livres are reduced to Francs by the reverse operation.

London Exchanges on Madrid in pounds, shillings, and pence.

The par 39½*d.* for 1 dollar or piece of eight.

Reduce 2964 dollars 3 reals, 17 marvadies, into sterling at par.

RULE.

Multiply by the price of exchange, and the product will be the answer in pence.

EXAMPLE.

2964 3 17 at 39½*d.* per dol.
39
———
26676
8892
1482—½
9⅞ for 2 reals, ¼ of 39½*d.*
5 for 1 ditto.
2½ for 17 marv.
———
12)117095¼
———
2|0)975|7 11¼
———
487 17 11¼
———
Ans. 487*l.* 17 11¼

Usance 60 days, and 14 days of grace.

Usance at Cadiz, 2 months, and 6 days of grace.

But bills refused acceptance in Spain are allowed no days of grace.

Madrid exchanges on London in dollars, reals, and marvadies,

34 marvadies = 1 real.
8 reals 1 dol. or piastre

Reduce 487*l.* 17 11¼ ster. into dollars at 39½*d.* per dol.

20
———
9757
12
———
117095
4 and take in the frac.
———
158)468381(2964
316
———
1523
1422
———
1018
948
———
701
632
———
69
8
———
158)552(3
474
———
78
34
———
312
234
———
158)2652(17 nearly
158
———
1072
1106
———

	Dol.	r.	m.
Ans.	2964	3	17.

4
———
158
———

London Exchanges on Lisbon in pounds, shillings, and pence.

Reduce 974—250 milreas into sterling, at 66*d.* per milrea.

RULE.

Multiply by the price of exchange, and cut off the 3 right-hand figures; the product will be the answer in pence and decimal parts of a penny.

EXAMPLE.

```
  974—250 at 66d. per milr.
       66
  ————————
  5854,500
 58455,00
 —————————
12)64300,500
 —————————
2|0)5358 4½
 —————————
```

Ans. 267 18 4½ sterling

Usance, 30 days after sight; and 6 days of grace on accepted bills only.

Lisbon exchanges on London in reas, pricking off every three figures (as is common in whole numbers) to assist the eye in distinguishing the thousands from the inferior numbers.

Reduce 267*l.* 18 4½ sterling into reas, at 66*d.* per milrea.

RULE.

Turn the given sum into pence (adding 3 ciphers) and divide by the price of exchange; the quotient will be the answer.

EXAMPLE.

```
Ster.267l. 18 4½ at 66d.per milr.
        20
      ————
      5358
        12
  ——————————
66)64300,500(974,250
   594
   ———
    490
    462
    ———
     280
     264
     ———
      165
      132
      ———
       330
       330
       ———
         0
         0
         —
```

Ans. 974 milr. 250 reas.

London exchanges on Leghorn in pounds, shillings; and pence.

Reduce 1876 dollars, 12 soldi, 6 denari, into sterling 50¼*d.* for 1 dollar of exchange.

RULE.

Multiply by the price of exchange, and the product will be the answer in pence.

EXAMPLE.

```
           1876 12 6 at 50¼d.
              50      per dollar.
            -----
           93800
¼—           469
½ of 50¼      25   for 10 soldi.
¼—             6¼  for 2s. 6d.
          ---------
        12)94300¼
          ---------
        2|0)785|8 4¼
          ---------
```

Answ. 392 18 4¼ sterling.

Usance 30 days after date.

No days of grace, but bills must be paid on the Monday, Wednesday, and Friday after they become due.

Leghorn exchanges on London in pezze or dollars, soldi, and denari.

12 denari = 1 soldi, or 8 reals.
20 soldi = 1 pezza or dollar of exchange.
Reduce 392*l.* 18 4¼ sterling, into dollars, at 50¼*d.* per dollar.

RULE.

Turn the sum given into farthings, and divide by the price of exchange.

EXAMPLE.

```
Sterl. 392 18 4¼ at 50¼d. p. dol.
        20          4
      ----        ----
      7858        201
        12
     -----
     94300
         4 and take in 2 for
     -----        fraction.
  201)377202(1876
      201
     ----
     1762
     1608
     ----
      1540
      1407
      ----
       1332
       1206
       ----
        126
         20
       ----
   201)2520(12
        201
        ---
        510
        402
        ---
        108
         12
   201)1296(6
       1206
                    Doll. soldi. d.
        Answ. 1876    12     6
```

London exchanges on Genoa in pounds, shillings, and pence.

Reduce 1197 dollars 15 soldi into sterling, at 49½ for 1 dollar or pezza out of bank.

RULE.

Multiply by the price of exchange, and the product will be the answer in pence.

EXAMPLE.

```
    1197 15  at 49½d. per
      49           doll.
   ------
   10773
   4788
 ½ — 598½
½ of 49½ 24¾ for 10 soldi.
 ½     12⅜ for  5 ditto.
  ----------
  12)59288½
  ----------
  2|0)494|0 8½
```

Answ. £.247 0 8½ sterling.

Usance, 3 months.

Days of grace, 30, but bills are generally protested in the week after they become due.

Genoa exchanges on London in pezze or dollars, soldi and denari, out of bank.

12 denari = 1 soldi.

20 soldi = 1 pezza or dollar of exchange.

Reduce 247*l.* 0 8½ sterling into dollars at 49½ per dollar.

RULE.

Turn the given sum into farthings, and divide by the price of exchange.

EXAMPLE.

```
Sterl. 247l. 0 8½d at 49½ p. dol.
          20          4
        ----       ----
        4940        198
          12       ----
       -----
       59288
           4
       -----
198)237154(1197
     198
     ---
     391
     198
     ---
      1935
      1782
      ----
       1534
       1386
       ----
        148
         20
        ---
   198)2960(15
        198
        ---
         980
         990
         ---
      doll. soldi.
Answ. 1197  15  out of bank.
```

London exchanges on Venice in pounds, shillings, and pence.

Reduce 4768 ducats, 22 grossi, 1 marchetti, into sterling at 51*d.* for 1 ducat banco.

RULE.

Multiply by the price of exchange, and the product will be the answer in pence.

EXAMPLE.

Banco Duc. 4768 22 1 at 51*d.*
51 per duc.

4768
23840
½ of 51*d.* 25½ for 12 gro.
12¾ for 6 ditto.
8½ for 4 ditto.
¼ for 1 march.

12)243215

2|0)2026|7 11

Answ. 1013*l.* 7 11 sterling.

Usance, 3 months; from Amsterdam and Hamburg, 6; days of grace 6, when the bank is open, exclusive of Sundays and holidays.

Venice exchanges on London in ducats, grossi, and marchetti.

5⅙ marchetti = 1 grossi.
22 grossi = 1 ducat.

Reduce 1013*l.* 7*s.* 11*d.* sterling into ducats, at 51*d.* per ducat.

RULE.

Turn the given sum into pence, and divide by the price of exchange.

EXAMPLE.

Sterl. 1013*l.* 7 11 at 51*d.* per
20 ducat.

20267
12

51)243215(4768
204

392
357

351
306

455
408

47
24

188
94

51)1128(22
102

108
102

5⅙
51)31(0

Answ. Duc. 4768 22 0

Change Sterling into Federal money, a dollar being 4s. 6d. equal to $\frac{9}{40}$ of a pound.

Change 108*l.* to federal money.

```
       40
      ----
    9)432(0
      ----
Dollars, 480 answer.
```

Change dollars into pounds sterling.

```
    $ 480
        9
    -----
  4|0)432(0
    -----
    108l. answer.
```

Change 108*l.* 10*s.* 6*d.*

```
            20
          ----
          2170
            12
         -----
54—    6)26046 00
         -----
       9)4341 00
         -----
       $ 482 33⅓ answer.
```

Change 482 dollars 33⅓ cents to pounds.

```
  48233⅓
       6 × 9 = 54
  ------
  289400
       9
  ------
12)26046|00
  -------
2|0)217|0 6
  -------
  108l. 10s. 6d. answer.
```

The Course of Exchange, &c. at the principal Ports of the Baltic Sea.

At Copenhagen accounts are generally kept in rix-dollars, marks, and schillings. 16 schillings are equal to 1 mark; and 6 marks, to 1 rix-dollar; or, in rix-dollars, schillings, and pence; 12 pence, equal to 1 schilling, and 148 schillings, to 1 rix-dollar.

Payments are made in old Danish bank notes of 1, 5, 10, 50, and 100, rix-dollars each; the small coin in circulation are 4, 2, and 1 schilling pieces, for general use: and the specie dollar, which is exactly the same as the Hamburg banco dollar.

Copenhagen draws on London at 2 months date, at 6 rix-dollars, 26 schillings, old Danish, per pound sterling, sometimes at 3 months date, at 2 schillings lower, with ½, ¾, or 1 per cent. lower, according as the discount is at Hamburg, or Holland, on the arrival of the post; they also draw at 14 days sight, or shorter, for 4 or 5 schillings per pound higher.

The Sound Duties are charged in specie, which nominally bears a fixed agio of 19½ per cent, on specie rix-dollars, reduced

to crowns, by 6 stivers to every specie rix-dollar, and 3 stivers for every crown dollar.

The accounts of the Sound duties are kept in rix-dollars and stivers. Such articles as do not appear in the tariff, pay in *privileged* ships, (or those of nations having a treaty of commerce with Denmark,) one per cent. on the value of the cocket, or other custom-house document, or original invoice; and, in *unprivileged* ships one and a quarter per cent. When no authenticated value appears, the custom-house officers fix it according to their own judgment: and it is extremely difficult to obtain any deduction from their charge.

At Stockholm the accounts are kept in rix-dollars, schillings, and runstiicks. Twelve runstiicks equal to one schilling, and 48 schillings to one rix-dollar.

There is a specie rix-dollar and a current rix-dollar, between which there is a difference of 50 per cent. There are, also, bank notes, as low as 12 schillings each, with copper money for small change.

There are, also, double, single, and half ducats, of which the single, as also the Dutch, ducats are of the value of 1 rix-dollar, and 47 schillings specie, or 11 dollars and 24 oert silver coin, or 35 dollars 8 oert, copper coin.

The copper coins are, double stanten, 2 oert silver, or 6 oert copper money; single stanten, which are called stivers, or written, at 1 oert silver, or 3 oert copper coin, Round pieces at 1 oert copper money. Half round pieces at half oert copper money.

The value of silver money is three times as much as that of copper, as 1 dollar of 4 marks, or 32 oert silver coin is 3 dollars, or 12 marks copper coin.

Stockholm draws on London at 75 days date, 4 rix-dollars 2 schillings specie, more or less for one pound sterling.

At Lubec accounts are kept in marks and schillings current. Sixteen schillings equal to one mark, and 12 pfennings to one schilling. The agio varies from 20 to 24 per cent. between banco and current.

The merchants constantly draw on Hamburg at 3 days date in banco money, receiving from one eighth to a quarter agio; and they draw on other places, in the same manner, at two months.

1 rix-dollar has 3 marks or 48 schillings Lubec.

Specie rix-dollars at 3 marks 6 schillings currency, more or less. 1 and 2 mark pieces, 8, 4, 2, and 1 schilling pieces, and 6 and 3 pfenning pieces.

At Stettin accounts are kept in rix-dollars, and gute grosch;

24 gute grosch are equal to 1 rix-dollar, and 1 gute grosch to 12 pfennings. They have several coins current, not used for mercantile accounts, as grosch, shillings, six-pences, dryers, and one penny pieces, which generally bear a discount of $1\frac{1}{8}$ to $1\frac{3}{4}$ per cent. compared with the grob current.

Bills of exchange are drawn and received in the above current money, and the course upon London is at 3 months date, so many rix-dollars and gute grosch for the pound sterling (average 6 dollars for the pound.)

At DANTZICK all business relative to exchange is done in Dutch ducats fixed at 12 florins each Dantzick currency. The Dantzick coin is greatly diminished, the course between it and Prussian is constantly the same. 100 guilders Prussian are equal to $133\frac{1}{3}$ florins Dantzick currency. A Prussian dollar is 3 guilders, which make 4 florins Dantzick.

Accounts are kept in florins and groschen: 30 groschen equal to 1 florin. 1 dollar has 3 guilders, 96 groschen, or 270 schillings Dantzick. 1 Prussian dollar is 4 florins, 120 grosh, or 360 schillings Dantzick. Old specie dollars have 6 guilders more or less. Timpffs, 18 groschen. Sixers have 6 groschen. Duitchen, 4 groschen. Poldraken, $1\frac{1}{2}$ groschen. Groschen pieces 3 schillings, and a schilling 6 pfennings.

1 marc Hamburg currency is equal to 47 groschen Dantzick.

1 florin Dantzick is equal to $9\frac{3}{8}$ pence English.

The course or exchange on London is from 22 to 25 florins, Dantzick currency per pound sterling, at 3 months date.

At KONIGSBURG accounts are kept in guilders and grosch: 30 grosch being equal to 1 guilder. The mean exchange on London is $18\frac{1}{2}$ Prussian guilders to the pound sterling, at three months date. In time of peace it fluctuates from 18 to 19 guilders; but it has lately varied from 16 to 21 guilders.

At MEMEL the accounts are kept as at Konigsburg, whither all bills are sent to be negotiated; and on which place, for payment, they give assignments at 3 days sight. For all timber shipped there is a *fixed* rate of exchange of 18 guilders per pound sterling, but for this article only. This has been settled by the merchants, to prevent disputes with masters or other agents who may purchase cargoes.

At RIGA accounts are kept in rix-dollars and ferdings; 80 ferdings to a rix-dollar. The silver money is mostly Dutch and Spanish; Holland ducats are at a variable exchange from 2 rix-dollars, 8 ferdings to 20 ferdings each, according to the demand. Russian money (both bank notes and silver) circulates also at variable exchanges, the latter from 127 to 130 copecks for 1 rix-

dollar, and bank notes from 155 to 176 copecks per rix-dollar The exchange on London is from 360 to 415 grosh per pound sterling; the grosh is a fictitious coin, and is reckoned by 90 grosh to a rix-dollar; the course on London is at 3 months.

At PETERSBURG accounts are kept in rubles and copecks; 100 copecks being equal to a ruble. All the current transactions are in bank assignations.

Petersburg draws on London at three months for so many pence per ruble.

Of Bills of Exchange.

A Bill of Exchange is a piece of paper, on which is written a short order, given by a banker, &c. for paying to such a person, or his order, a certain sum of money, at an appointed time.

In order to understand this subject, it will be necessary to explain the terms used in bills of exchange.

The *drawer* is the person who draws the bill of exchange.

The *drawee* is the person upon whom it is drawn; and he is so called *before* he accepts the same; but after he has accepted, he is then called the *acceptor*.

An *indorser.*—Every person, before he can pay away, or pass a bill of exchange, must, if it be made payable to his order, write his name on the back of the bill; and he is therefore called an *indorser*.

An *indorsee* is any person who is in possession of a bill of exchange, in consequence of its having been indorsed to him.

The *payee* is the person in whose favor a bill is drawn; as, if A. draws upon B., directing him "*to pay* to C. *or order*," C. is called the payee; and, before C. can pass away the same, he must *indorse* it.

If the drawee refuse to accept or pay the bill, the payee must cause it to be protested.

A protest signifies to the drawer, that the party upon whom he drew his bill is unwilling, not to be found, or insolvent; and to let him (the drawer) have timely notice thereof; and also to enable the party to recover against the drawer; and also against the acceptor, as far as he can pay, if the bill be accepted.

A foreign bill must be protested on the last day of the three days of grace allowed; (after the time expressed upon the bill;) and if not paid upon the last of the three days, the party ought immediately to protest the bill and return it; but, if the last of

the three days be a great holiday, the day before is the day of payment.

Bills of exchange must be sued for within six years after their becoming due.

If two or three bills are drawn for the same sum, they shall carry a condition with them that only one should be paid; and, in a declaration on one of them, it is not necessary to aver that the other bills were not paid.

Of Inland Bills.

Inland bills of exchange are those drawn by one banker, merchant, or tradesman, residing in one part of the kingdom, on another residing in London, or in some city or town in the said kingdom.

The possessor should present it for acceptance as soon as it comes to his hands, though the time expressed be not expired; for by acceptance his security is increased.

Acceptance is made by the drawee, or his partner or clerk, in writing, upon the bill.

If the bill is not paid within three days after the time expressed thereon be elapsed, it must be protested; which protest, or notice thereof, shall be sent within fourteen days to the drawer. Protests to be made by a notary public, or by any other substantial person, of the city, town, or place, in the presence of two or more creditable witnesses; refusal or neglect being first made of due payment of the same; which protest shall be made, and written under a fair copy of the said bill of exchange, in the words or form following:

Know all men, that I, A. B., on the day of , at the usual place of abode of the said , have demanded the payment of the bill of which this is a copy, which the said did not pay; whereof I, the said , do hereby protest the said bill, dated at this day of

If the bill be not accepted, the drawer shall not be liable to damages and interest, unless protest or notice of such non-acceptance be sent to the drawer in fourteen days.

A person accepting of a bill in satisfaction of a debt, must get it protested, if not paid in course, or lose such debt.

From want of protest, the party cannot recover interest and cost upon an inland bill against the drawer.

If A. sells goods to B., and B. is to give a bill in satisfaction, B. is so far discharged, that he cannot be sued for the goods, though the bill be never paid; for, the bill is payment: but he is liable to be sued for the bill.

A note or bill is no absolute payment, though agreed to be such, if the giver of it knows the person upon whom it is drawn to be in a failing condition.

Of what shall be deemed a Bill of Exchange.

The custom prescribes the form of a bill, and raises a contract.

It is not requisite to observe the same nicety in a bill of exchange as in deeds and wills.

A bill, payable out of a particular fund, is no bill of exchange.

Pray pay out of my growing subsistence—is no bill of exchange.

A bill, payable out of the fifth payment, as it shall become due, is not good.

Pray pay J. S., or order, at my quarterly half pay per advance, is a negotiable bill.

Bill, without the words *value received*, is no bill of exchange.

Bill, payable to *me*, or my order, is a good bill, if accepted.

Of the Acceptance.

The acceptance of a bill of exchange is such an act, by the drawee, as will make him liable to pay the same. It is usually made by signing his name or initials at the bottom of the bill, when it is presented to him by the bearer.

A very small matter will amount to an acceptance; and any words will be sufficient for that purpose, which show the party's assent or agreement to the bill; as,

Writing the day of the month on a bill is sufficient acceptance.*

Leave your bill with me and call to-morrow, and it shall be accepted, is a sufficient acceptance.

Leave your bill with me, and I will look over my books and accounts between the drawer and me, and call to-morrow, and the bill shall be accepted, is not a sufficient acceptance.

* A cause, *Thornton* v. *Dick*, was tried in March, 1803, before the lord chief justice Ellenborough. It was an action against the defendant, as acceptor of a bill of exchange after sight. He had accepted the bill, but, doubting the responsibility of the drawer, he afterwards, before the bill was called for, erased his name, and obliterated the acceptance. It became a question, whether having once accepted, he could afterwards erase it. Lord Ellenborough held the law to be clear, that a person having once put his name as acceptor, was from that moment bound. The bill had a currency from that time, and any alteration on the face of the bill discharged the drawer. The verdict was for the plaintiff.

But, if a bill be thus accepted, although the cancellation of the acceptance once made by the drawee cannot be valid *per se*, yet, if the holder erroneously note such bill for non-acceptance, he deprives himself of the right to sue as for a regular acceptance, which would otherwise have accrued to him; and must not seek his remedy against the drawee. *Bentinck* v. *Dorrien* and another, Term Rep., Hilary, 45 Geo. III.

When a bill was returned for non-acceptance, the drawee said, *that if it came back again, he would pay it;* it was ruled to be a good acceptance.

Verbal acceptance is sufficient: and an action lies against the acceptor thereon, as to the principal, but not for interest and costs. But there must be a witness. These words, "The two bills of exchange which you sent me, I will pay, in case the owners of the Queen Anne do not," are a sufficient acceptance.

Acceptance, to pay when the goods are sold, is a good acceptance.

Acceptance, to pay half in money, half in bills, is good.

Acceptance, to pay, according to the tenor of the bill, after the day of payment is past, is good.

A bill may be accepted for part, and the sum accepted for is good against the acceptor.

Acceptance of a bill, drawn upon two partners, by one of them, binds both, if it concerns the joint trade.

Acceptance of a servant, usually transacting business for his master, is good: yet the servant should express such acceptance to be for his master, or he is liable himself.

Of the Protest.

If, before a bill be accepted, and even before it be due, it shall be indorsed to any person, the said indorsee may, immediately after the drawee has refused to accept it, bring an action against the indorser.

A protest is absolutely necessary on a foreign bill, where it is refused acceptance or payment, in order to charge the drawer.

The payee must demand acceptance from the drawee before protest.

If a payee dies, there can be no protest before probate or administration.

If a bill, left for acceptance, be lost, the drawee must give a note for the payment thereof, otherwise it may be protested.

If a bill be lost, and no new one can be had, and the drawee does not insist on having the original, but refuses payment on another account, a protest made on a copy is sufficient.

A protest is good evidence of non-acceptance or non-payment, until the contrary is proved.

A protest on a foreign bill is necessary to recover against the drawer, not only interest and costs, but also principal; and such protest must be made in due time, and timely notice given to the drawer. What is a *timely* notice must be determined by the customs of the merchants. Convenient notice must be given to the drawer of an inland bill; which notice, as to time, must also rest upon the custom and verdict of a jury.

But, in case of non-payment of either foreign or inland bills, the safest way is to give as early notice, to the person of whom it was received, as possible; that is, by the first post, or rather to send the bill to a correspondent, to tender it to the drawer or indorser. Where they refuse to accept the bill, it may be protested, before the day of payment, for better security, but not for non-payment.

Of Indorsements.

Every man, who writes his name upon the back of a bill, becomes bound to the next holder for the amount thereof; it matters not whether he has received any value for the bill, or does it to serve a friend. The indorsement of his name implies him to have received the value of the bill, and the law will compel him to be answerable for the same to the holder thereof.

Of who shall pay the Money.

Every drawer, indorser, and acceptor, of a bill of exchange, is separately liable to the payment thereof.

On non-payment, the payee (the person to whom it is to be paid, may sue the acceptor and drawer: but he can have but one satisfaction, that is, he can only recover from them jointly the amount of the bill in his hands.

He who accepts for the honour of the drawer, is liable to the payment, although he may have no effects. The acceptance is an undertaking for the payment, and the law will oblige him.

If a bill be indorsed to the drawer of it, he may maintain an action, as the indorsee, against the drawee, if the latter had effects of the drawer at the time of drawing the bill; otherwise not.

The holder of a bill must tender it before the three days grace are expired.

If the indorsee indulges the acceptor after the bill is due in course of payment, it is at his own risk; and, if the acceptor fails, he has no remedy against the drawer, or person who paid him the bill.

The last indorser of the bill of exchange may maintain an action against any of the former indorsers, and so any indorser may against all that precede him.

An indorser of a bill, who has paid it, must prove payment in an action against the acceptor.

The indorser of a foreign bill of exchange may be charged, without first resorting to the drawer.

If the indorsee receive a sum, in part, of the acceptor, he has no remedy against the drawer or indorser for the remainder, but against the acceptor only.

A man cannot be sued in England, Scotland, or Ireland, on his acceptance of any bill of exchange abroad, after he has been discharged by the laws of that country.

It is not necessary to prove the hand of the drawer in an action against the acceptor, nor can the acceptor set up the forgery of the bill.

The assignee of the indorsee may sue, on a general indorsement, to the latter only.

The winner shall not recover, on a bill of exchange, for money won at play, against the acceptor, otherwise than in case of an indorsee.

If A. draws a bill payable to B. for the use of C., and B. indorses it to D.—D. may bring an action for the money.

If a bill be assigned for a just debt, equity will not relieve, though the bill was at first given without consideration.

Bill upon B., payable to C., is accepted by B., and indorsed by C. to D. Then B. is discharged of any payment as to C.

The Drawer of Bills

Should be well satisfied that they will be accepted and duly honoured before he draws: to this end, it is requisite that he be assured of having effects in the hands of the person drawn upon; and also that he be a man of integrity and punctuality, who will not dishonour his paper, but pay it regularly as it is due.

The Acceptor

Should be careful to accept no bill but what he has effects in his hands to answer.

To insist upon his correspondent advising of each bill so soon as drawn, specifying the number, date, sum, time, and to whom payable; for, if he should accept or pay a forged draft, the loss will fall on himself.

To adjust and balance all accounts of this nature at least once in three months, and oftener if the drafts are large and continual.

The Bill-Holder

Should exchange no drafts for a stranger, when he is not convinced of the validity thereof from the *writing* of the drawer or acceptor; if he be not satisfied on this head, he may offer to send the bill to one of the parties, and, when in cash, that he will account with him for the value.

See that the bill be drawn in a proper manner; and make the person, paying the bill to you, indorse his name on the back. Take a regular copy of the particulars of the bill in a book.

If the bill be not already accepted, present it for acceptance.

If the person it is drawn upon will not accept, and also adds he will not pay it when due, return it to the indorser or drawer immediately, taking a good bill or cash for the same.

But, if the drawee says he may pay it when due, wait till that day, present it for payment, and if then refused, have it protested, and for the amount call upon the indorser. But, as you have at present the indorser and drawer as your security, be cautious how you give up the bill to either for their single security, if doubtful.

When you remit a bill, indorse on the back thereof, "pay the contents to A. B. or C. or order, D. E." This will prevent the bill's being negociated, should it fall into bad hands.

If the bill be payable to bearer, write, upon the face thereof, "sent by post, December, 1821, to A. B. of C. D. E." in red ink. Indorse no bill until you pay it away.

Owners of Ships.

By the act 26 Geo. III. c. 86. it is enacted, That,

1. *Owners not answerable for loss of goods, by master or mariners, beyond the value of ship and freight.*—No person, who is owner of any ship or vessel, shall be liable to answer or make good any loss or damage, by reason of any robbery, embezzlement, secreting, or making away with, of any gold, silver, diamonds, jewels, precious stones, or other goods or merchandise, which shall be shipped on board any ship or vessel; or for any act, damage, or forfeiture, done or incurred from the passing of this act, without the knowledge of such owner; farther than the value of the ship or vessel, with all her appurtenances, and the full amount of the freight due, or to grow due, for the voyage wherein such robbery, embezzlement, secreting, or making away with, shall be made, although the master or mariners shall not be concerned in, or privy to, such robbery, embezzlement, secreting, or making away with.

2. *Owners not answerable for loss by fire.*—No owner of any ship or vessel shall be liable to answer or make good any loss or damage which may happen to any goods or merchandise whatsoever, which shall be shipped and put on board such ship or vessel, by reason or means of any fire happening to, or on board of, the said ship or vessel.

3. *Masters or owners not answerable for loss of goods, unless their nature, quality, and value, are made known upon shipping.*—No master or owner of any ship or vessel, shall be subject or liable to answer for, or make good, any loss or damage which may happen to any gold, silver, diamonds, watches, jewels,

or precious stones, which shall be shipped on board any such ship or vessel, by reason of any robbery, embezzlement, making away with, or secreting, thereof, unless the owner or shipper thereof shall, at the time of shipping the same, insert in his bill of lading, or declare in writing to the master or owner of such ship or vessel, the true nature, quality, and value, of such gold, silver, diamonds, &c.

4. *When ship and freight are not equal to all the losses.*—If several freighters or proprietors of any such gold, silver, &c., shall suffer any loss or damage by any of the means aforesaid, in the same voyage (fire only excepted,) and the value of the ship or vessel and freight, shall not be sufficient to make full compensation to all of them, then such freighters or proprietors shall receive satisfaction thereout in proportion to their respective losses; and, in every such case, it shall be lawful for such freighters, or proprietors, or any of them, on behalf of himself and all other such freighters or proprietors, or for the owners of such ship, to exhibit a bill, in any court of equity, for a discovery of the total amount of such losses, and of the value of such ship or vessel, appurtenances, and freight, and for an equal distribution and payment amongst such freighters or proprietors, in proportion to their respective losses, according to the rules of equity. Provided that, if any such bill shall be exhibited on behalf of the part-owners of such ship, the plaintiff or plaintiffs shall thereto annex an affidavit that he or they do not collude with any of the defendants; and shall thereby offer to pay the value of such ship or vessel, appurtenances, and freight, as such court shall direct.

5. *Remedies against the master and mariners.*—Provided that nothing shall extend to discharge any remedy which any person or persons now hath or have, or may hereafter have, against the master or mariners of such ship, in respect of any embezzlement, secreting, or making away with, any gold, silver, &c. shipped or loaden on board such ship or vessel; or on account of any fraud, abuse, or malversation, of and in such master and mariners respectively; but it shall be lawful for every such person or persons, so injured, to pursue such remedy against the said master and mariners, as they might have done before the making of this act.

6. This act shall be a public act.

Thirdly.—By the act 53 Geo. III. c. 159.

1. *Owners not answerable for loss beyond the value of the ship, &c.*—From the 1st of September, 1813 no owner or owners, or part owner or owners, of any ship or vessel, shall be liable to make good any loss or damage occasioned by any act or neglect which may happen, without the fault or privity of such owner or owners, to any goods, wares, or property, laden

on board that ship, or any other ship, farther than the value of ship or vessel, with all its appurtenances, and the freight due, or growing due, during the voyage which may be in prosecution, or contracted for, at the time when the loss of damage happens.

2. *What shall be considered as freight.*—The value of the carriage of any goods, &c. belonging to the owner or any of the owners, and also the hire due or to grow due under any contract whatsoever, (except only such hire, as in the case of a ship or vessel hired for time, may not begin to be earned until the expiration of six calendar months after the happening of such loss or damage,) shall be considered as *freight*, within the intent and meaning of this act, and of preceding acts.

3. *Separate losses.*—In case any loss or damage happens by more than one distinct accident, act, neglect, or default, or on more than one occasion, in the course of a voyage, or after the end of a voyage, and before the commencement of another, every such loss or damage shall be compensated according to the provisions of this act, in the same way, and to the same extent, as if no other loss or damage had happened or arisen during the same voyage, or after the end of one voyage and before the commencement of another.

4, 5. *Masters, mariners, owners of lighters, &c.*—Nothing herein contained shall lessen the responsibility to which a master or mariner of any ship or vessel may now by law be liable, notwithstanding such master or mariner may be an owner, or part owner: nor extend to the owner or owners of any lighter, barge, boat, or vessel, of any burthen or description whatsoever, used solely in rivers or inland navigation, or of any ship or vessel not duly registered according to law.

6. *Actions may be brought for damage, &c.*—Nor does the act extend to prevent any action or suit being instituted, or proceeded in, in any court of competent jurisdiction, by persons who have suffered loss or damage, notwithstanding other persons may have suffered loss or damage by the same accident, &c. or on the same occasion; but all such actions may be instituted and proceeded in, in the same manner as if this act had not been made; subject, nevertheless, to such order as any court may think fit to make, to restrain proceedings on special circumstances, as justice and equity may require.

7. *When ship and freight are not equal to all the losses.*—If several persons suffer loss or damage in their goods, ships, or otherwise, and the value of the ship, with her appurtenances, and the amount of the freight, shall not be sufficient to make full compensation to all persons suffering such loss; it shall be lawful for the person or persons who are liable to make satisfaction, or any one or more of them, on behalf of himself, herself, or themselves, and the other owner or owners, to exhibit

a bill in a court of equity, against all the persons who shall have brought any such action or actions, and all other persons who shall claim to be entitled to recompense for similar loss, to ascertain the amount of the value of the ship or vessel, appurtenances, and freight, and for payment or distribution thereof rateably amongst the several persons claiming recompense, in proportion to the amount of the several losses sustained, according to the rules of equity, and as the case may require: provided always, that the plaintiffs in such bill shall annex to it an affidavit, that he, she, or they, do not directly or indirectly collude with any of the defendants, or with any other owner or owners of the same ship or vessel, or with any other person or persons, but that such bill is filed for the purposes only of justice, and to obtain the benefit of the provisions of this act; and, that the several persons named as defendants are, as the person or persons making such affidavit verily believes, all the persons claiming to be entitled to recompense for loss or damage sustained by the same accident, &c. or on the same occason; and that all such defendants do claim such recompense, and to be entitled to proportions of the value of such ship or vessel, appurtenances, and freight; and that no other person claims to be entitled to any proportion thereof under the provisions of this act, and that the amount of the value of such ship or vessel, appurtenances, and freight, does not exceed a sum to be specified in such affidavit; and, that the several claims made by the defendants, do exceed the amount of the value of such ship or vessel, appurtenances, and freight; and the plaintiff or plaintiffs shall, on filing such bill, apply to the court and obtain an order for liberty to pay into court the amount of the value, as ascertained by such affidavit, and shall pay the same into court according to such order; and no defendant to such bill shall be compellable to put in any answer thereto until such value shall have been paid into court, unless the court shall, for any special cause, think fit to order security to be given for the same, in such manner as the court shall think fit; either, instead of payment thereof into court as aforesaid, or until such court shall make other order to the contrary: and, unless such money shall be paid into court, or the court shall make such order for security, and such security shall be given according to the order, within one month after such bill shall have been filed, the bill shall immediately, after the expiration of the month, stand dismissed without any motion for that purpose; and the court shall thereupon order the payment of the costs of suit to all the defendants who shall then have appeared to such bill; and, in case such security shall be given, and the value shall afterwards be ordered to be paid into court, and the same shall not be so paid within the time to be limited, such bill shall also

stand dismissed without motion for that purpose; and the court shall also order costs to be paid to the defendants; and in case any bill shall at any time be dismissed after such value shall have been paid into court, or such security given, the court shall direct the money so paid into court, if any, to be paid to the several claimants, who shall appear to be entitled to proportions thereof, in such manner as shall appear to be just, and shall order any security so to be given to be put in suit, and the money to be recovered thereupon to be paid into court and distributed in like manner; and such payments shall be, without prejudice to any action or suit which may be instituted by any other person or persons, not party or parties to such bill, for any such loss or damage as aforesaid, although such loss or damage shall have arisen or happened by the same accident, act, neglect, or default, or on the same occasion as the losses or damages for which recompense shall be claimed by the parties defendants to such bill, and all such payments as shall be made under the order of the court shall be without prejudice to the recovery of the costs in any action or suit which shall have been brought by any such defendant or defendants, unless such costs shall be otherwise provided for by the said court.

8. *Provision in case the true value of the vessel, &c. be not paid.*—If it shall appear to the court, that the money paid in, or for which security shall be given, is not the true amount of the value, the court shall order such further sum to be paid, or such further security to be given, as shall seem proper; and the court shall also, at any time, if it shall see fit, order security to be given for the costs of suit; and if such further sum of money shall not be paid, or such further security shall not be given within the time to be limited for that purpose, such bill shall stand dismissed; and the court shall thereupon order the payment of costs to the several defendants by the plaintiffs, and give the proper directions for the application of any money paid into court, or due on any security given, to answer the demands of the several defendants, as shall appear to be just.

9. *Costs in abatement of suits.*—If, after any such suit shall have been instituted the same shall become abated or imperfect, in the whole or in part, and the same shall not be revived or made perfect within the time to be limited for that purpose, such suit and all proceedings therein shall stand dismissed; and the court shall order the costs to be paid to the defendants, or to the representatives of any who shall be then dead; and if the plaintiff or plaintiffs in any such suit, or any of them, shall be then dead, such costs as shall not be otherwise paid, shall be a charge on the assets of such deceased plaintiff or plaintiffs, and shall be recoverable as a debt by simple contract.

10. *Court to ascertain the value, &c.*—The court in which

any such bill shall be filed as aforesaid, is hereby authorized to take all such measures as to such court shall seem just for ascertaining the value of the ship or vessel, appurtenances, and freight, the amount of the losses or damages claimed by the defendants respectively, and all such matters as shall be necessary for the purposes of justice, and for payment and distribution of the value, amongst the several persons entitled thereto, and generally to do therein as shall appear to be just; and the costs of all such proceedings shall be paid by the plaintiff or plaintiffs, unless such court shall think fit otherwise to order.

11. *Costs to be taxed.*—All costs to be paid by the plaintiff or plaintiffs shall be taxed and settled as between attorney and client, if the court shall think fit so to order.

12. *New bills not to be filed.*—If any bill shall be filed, and afterwards be dismissed by reason of default of the plaintiff or plaintiffs, or under any order of the said court, no new bill shall be filed by the same plaintiff or plaintiffs, or their representatives, or by any other part-owner or part-owners, unless the court shall order such dismission to be without prejudice to the filing of a new bill, either absolutely or under such conditions as to the court shall seem just.

13. *Interest of money paid into court.*—If any money shall be paid into any such court of equity as aforesaid, in respect of the value of any such ship or vessel, appurtenances, or freight, all interest and profit made thereof whilst such money shall remain in court shall be considered as belonging to the parties in such suit, who shall appear to be entitled to the principal money or proportions thereof respectively, and shall be divided and distributed accordingly; and if security shall be given for such value, or any part thereof, the same shall bear interest, and such interest shall be applied in like manner.

14. *Bill filed by one part-owner.*—If any such bill shall be filed as aforesaid by any part-owner or part-owners, on behalf of himself, or themselves, and the other part-owners, such bill shall bind all such other part-owners, and their representatives, in the same manner as they would have been bound of parties plaintiffs to such bill; and if, after the filing of any such bill any of the plaintiffs or other part-owners shall die, the right of action against such part-owners so dying, founded on any tort or wrong, shall not thereby be lost, but it shall be lawful to proceed against the respective representatives of the part owners so dying, in the same manner as might have been if such right of action had been founded on contract.

15. Any court competent to act as a court of equity, is to be deemed such for the purposes of this act.

16. All money which shall be paid for, or on account of, any loss or damage, or any costs incurred in relation thereto, shall

be brought into account among the part-owners as money disbursed for the use thereof.

17. This act shall be deemed a public act, &c.

Besides the preceding acts of parliament, which affect the interest of ship-owners, there are other rules of law to which they are subject; the principal of which will be found in the subsequent part of this chapter.

Goods spoiled by default of a master.—If goods are spoiled by default of a master of a ship employed by the owners, the owners are liable; but the action must be brought against all the part-owners, who make but one master.

Part-owners not agreeing about a voyage.—If several part-owners wish to send a ship on a voyage, but two or three other part-owners refuse their consent, the former may send her on the voyage, but they must enter into a recognizance in the admiralty for her safe return.

A part-owner of a ship sued the other owners for his share of the freight on finishing her voyage; but the other owners had fitted her out, in which, complainant would not join; whereupon the other owners complained in the admiralty; and, by order, there they gave security, if the ship perished in the voyage, to make good to the plaintiff his share, or to that effect; in such a case, by the law marine and course of the admiralty, the plaintiff was to have no share in the freight. It was referred to sir Lionel Jenkins to certify the course of the admiralty, who certified accordingly, and that it was so in all places, for otherwise there would be no navigation: whereupon the plaintiff's bill was dismissed.

In what case the owner of a ship, letting it to another, is still liable for loss.—The defendant was sole owner of a ship, which he let out to one Fletcher for a voyage for a certain sum, and Fletcher was to have the benefit of carrying goods. The plaintiff sent a quantity of moidores, and had bills of lading signed by the captain: and, many of the moidores not being delivered according to consignment, an action was brought against the defendant, the owner of the ship, to make him liable, as far as the ship and freight were worth, according to 7 Geo. II., c. 15.

For the defendant it was insisted, that, though the ship was his property, yet that Fletcher is for this purpose the owner. But, it appearing that the defendant had covenanted for the condition of the ship and the behaviour of the master, the chief-justice held he was liable to the plaintiff: and the freight he had in general from Fletcher was sufficient, though the identical freight for the gold belonged to the other; and Fletcher had only the use of the ship, but no ownership. 2 Strange's Rep., 1251.

Repairing a ship.—If a ship be repaired in the river Thames, and fitted out there with new rigging and apparel, the ship itself is not liable, but the owners. If she be repaired abroad, the ship is liable, and the master may hypothecate (or pawn) her for payment of the charges.

The repairer of a ship may sue either the master who employs him or the owners: but if he undertake it on a special promise from either, the other is discharged.

An action was brought by a shipwright for repairing the defendant's ship in his dock. About three hours before the ship's repairs were finished, a fire happened, and she was burnt. Notwithstanding which, the court held that the owner was liable to pay for the repairs that had been done.

Owners liable for provisions, &c., bought by the master.—If the master of a ship buy provisions for her, and have money of the owners to pay for the provisions, but sail without paying the money, the owners are liable to pay, in proportion to their respective shares in the ship, the master being but a servant to the owners. 2 Vern. Rep. 643.

Master not liable for stores ordered before, but delivered after, his appointment as master.—Lord Mansfield, in delivering his opinion of the court in the case of Farmer and another against Davis, where goods were ordered for a ship by the owner before the appointment of the captain, and some of which goods were delivered after his appointment, said, " Where a captain contracts for the use of a ship, the credit is given to him, in respect of his contract: it is given to the owners, because the contract is on their account; and the tradesman has likewise a specific lien on the ship itself. Therefore, in general, the tradesman who gives that credit, debits both the captain and the owners. Now, what is this case? The captain made no contract personally: the owners contracted for their ship: the credit was given to them only: and there is not a shadow of colour to charge the captain with any part of these goods."

Master has no lien on the ship for his wages; nor for money paid for stores and repairs.—Wilkin and others, assignees of Brooke, a bankrupt, against Carmichael. The question in this case was, whether a captain, having paid for stores supplied, and repairs done, to a ship in England, and having wages due to him, has such a lien on the ship as to be entitled to keep her till he is paid?

Lord Mansfield said, " Notwithstanding the strongest inclination that the defendant (the captain) should have full satisfaction, we are not able to find ground on which we can give judgment in his favour. 1. He has set up a lien upon two sorts of claim; viz. wages, and stores and repairs. As to wages, there was no particular contract that the ship should be a pledge;

there is no usage in trade to that purpose; nor any implication from the nature of the dealing. On the contrary, the law has always considered the captain as contracting personally with the owner, and the case of the captain has, in that respect, been distinguished from that of all other persons belonging to the ship: this rule of law may have its foundation in policy, for the benefit of navigation; for, as ships may be making profit and earning every day, it might be attended with great inconvenience, if, on the charge of a captain for misbehaviour, or any other reason, he should be entitled to keep the ship till he is paid. As to stores and repairs, it is a strong answer to that claim, that when the demand was made to the assignees, the captain had not paid the tradesmen's bills. But, if there was any lien originally, it was in the carpenter. The captain could not, by paying him, be in a better situation than he was, and he had parted with the possession; so that he had given up his lien, if he ever had one; the other creditors had none. If the defendant is liable to the tradesmen, it is by his own act. Work done for a ship in England is supposed to be done on the personal credit of the employer; in foreign parts the captain may hypothecate the ship. The defendant might have told the tradesmen, that he only acted as an agent, and that they must look to the owner for payment."—Judgment for the plaintiff.

Owners liable for necessaries ordered by the master, whether they know of it or not.—The plaintiffs being rope-makers, supplied the ship Henry and Thomas with cables to the value of 5*l.* 8*s.* 3*d.* by the order of Thomas Harwood, the captain: and made Harwood and the owners of the ship (the defendant) the debtors, in the usual manner, without naming the owners, or knowing particularly who they were.—The ship Henry and Thomas had been let by the defendants to Harwood upon certain articles, in which it was mutually covenanted between them as follows: 1st; The owners covenanted with Harwood, that, on his performance of a covenant stipulated on his part, he should have the sole management of the ship, and employ her for his sole benefit and advantage for the space of eleven years, if he should so long live, and the ship should not be lost. The covenants on the part of Harwood were, (amongst others,) to pay a yearly rent of 36*l.* per cent., at stated periods; that he would, at all times, at his own cost and charge, repair, maintain, and keep the vessel and her rigging, &c., in good and sufficient repair. The plaintiffs had no notice of this contract at the time they furnished Harwood, the captain, with the goods. The question was, whether the defendants were liable to this debt.

Lord Mansfield, in delivering judgment, said, "This case was reserved, not with a view to the particular matter in dispute, or the parties now before the court, but in consideration of a

general anxiety in the owners of ships, employed in this trade, to know how far they are by law liable for the acts of their respective lessees. In that point of view we have considered the case very particularly; and, after the fullest deliberation, we think it impossible to say that the plaintiffs are not entitled to recover. Whoever supplies a ship with necessaries has a treble security. 1. The person of the master. 2. The specific ship. 3. The personal security of the owners, *whether they knew of the supply or not.*—1. The master is personally liable as making the contract. 2. The owners are liable in consequence of the master's act, because they choose him: they run the risk, and they say whom they will trust with the appointment and office of master. Suppose the owners in this case had delivered the value of the goods in question in specie to the master, with directions for him to pay it over to the creditors, that the master had embezzled the money: it would have been no concern of the creditors; for they trust specifically to the ship, and generally to the owners. In this case, the defendants are the owners; and there happens to be a private agreement between them and the master, by which he is to have the sole conduct and management of the ship; and to keep her in repair, &c. But how does that affect the creditors, who it is expressly stated, were total strangers to the transaction? And that is an answer to the observation, that the plaintiff must have known the real situation of the matter, in this case, from the general usage and custom of the country in that respect. To be sure, if it appeared that a tradesman had notice of such a contract; and, in consequence of it, gave credit to the captain individually as the responsible person, particular circumstances of that sort might afford a ground to say, he meant to absolve the owner, and to look singly to the personal security of the master; but here it is stated, that the plaintiff had no notice whatever of the contract. The owners themselves are aware of their being liable at the time; they choose a master to whom they agree to let the ship, and trust for their security to the covenants which they oblige him to enter into: these covenants are that he shall be obliged to keep the ship in repair, and deliver her up, at the end of the term, in as good condition as when delivered to him. This is not all; for they indemnify themselves against the private debts of the master, and against his being taken in execution; for, if he does not perform all and every the covenants in the agreement, (except in case of the loss of the ship,) the consequence (beside their remedy against him upon the covenant) is, that the contract and agreement are to be absolutely at an end, and they are to take possession of the ship.

"Suppose the ship had been impounded in the admiralty court, and that happened at the end of the term; or, suppose

the captain had broken a covenant which had put an end to the agreement; the defendant could never have taken the ship out of court, without paying the debt for which the ship was impounded. We are all of opinion, therefore, that, under these circumstances, there is no colour to say that the creditors shall be stripped of the general security they are, by law, entitled to against the owners."—Rich, executor, *v.* Coe and another.

Those who intend to acquire the property of a ship, by purchase, should previously ascertain that the person who proposes to sell is legally empowered to do so: for, although a sale of other goods, by the person who is in possession of them, may, in many cases, vest the property in the buyer, even when the seller himself has neither property in them or authority to dispose of them, it is not so with respect to ships; for the sale of which there is no open market. Written documents always determine this species of property; and the buyer has therefore the means of ascertaining the title of any one who offers to sell, and can seldom be deceived unless by his own fault.

The requisite documents not only furnish the owner with proof of his property, but also enable him to dispose of it when the ship is at sea, or in a foreign port. When a ship is at home, and a delivery of actual possession is possible, such delivery is necessary to give a perfect title to the buyer, in case of the sale of a whole ship; for, although as between buyer and seller it may be completed by payment of the price, without delivery of possession; yet, if the buyer suffer the seller to remain in possession and act as owner, and the seller in the mean time become bankrupt, the property may be considered as remaining in him for the benefit of his creditors; also, if an execution issue upon a judgment against the seller, the sale may, perhaps, be deemed fraudulent and void as against the party who has obtained the judgment.

In case of a sale, or agreement for sale, *of a part only*, it has been thought sufficient, if the vendor, having delivered the muniments of his title, ceased from the time to act as a part-owner, actual delivery of a part being considered impossible. This, however, is to be understood with some limitation: for, if a part-owner has the *actual* possession of the ship, it is not impossible for him to deliver the possession: but if he has *not* the actual possession, the possession of the other part-owners may reasonably be considered to be the possession of the vendee after the sale.

In the case of an absolute sale it can rarely happen, in practice, that the seller should continue in possession; but the rule extends also to mortgages of ships, and with regard to them has often been regularly enforced. But when a ship is abroad, a perfect transfer of the property may, at the common law, be made by assignment of the grand bill of sale and delivery of

that and the other documents relating to the ship, as the delivery of the key of a warehouse to the buyer of goods contained therein is held to change the property of the goods, according to the rule of the civil law; such delivery, in each case, being not merely a symbol, but the mode of enabling the buyer to take actual possession, as soon as circumstances will permit. *Abbott*, p. 11, 12.

For an explanation of the law relative to the sale of a ship by the master, see the next chapter.

Masters of Ships.

Nothing more materially concerns the master of a ship, than to know what degree of responsibility is attached to his situation, and what privileges it invests him with: and it is the design of this chapter to explain them. The master and owner are, however, so intimately connected together, that many observations in the preceding chapter of owners, will be found to be necessary knowledge for the master of a ship. The doctrine of marine insurances, too, he should be well acquainted with, in order that he may not, by his conduct, inadvertently prejudice his owner's claim on the underwriters.

Masters of ships responsible for goods committed to their charge.—The law makes no distinction between carriers *by land*, and carriers *by water;* and, for whatever losses that arise from the neglect of persons employed under them, they are answerable; whatever cases, therefore, that are contained in this chapter, relative to carriers by land, must be understood to be equally applicable to carriers by water, such as masters of ships and hoymen.

The master of a ship is liable for goods of which the ship is robbed in the river.—The reasons are: 1. Because he is an officer known. 2. Because he receives his salary out of that which is paid for the freight. But the master may reimburse himself out of the mariners' wages for a loss happening by their neglect.

Masters are charged to carry goods against all events but the acts of God and the king's enemies.—The plaintiff put goods on board the defendant's hoy, who was a common carrier. Coming through a bridge, by a sudden gust of wind the hoy sunk, and the goods were spoiled. The plaintiff insisted that the defendant should be liable, it being his carelessness in going through at such a time; and offered some evidence, that, if the hoy had been in good order, it would not have sunk with the stroke it received; and thence inferred, the defendant was answerable for all accidents, which would not have happened to the goods in case they had been put in a better hoy. But the

chief justice held the defendant not answerable, the damage being occasioned by the act of God; for, though the defendant ought not to have ventured to shoot the bridge if the general bent of the weather had been tempestuous, yet this, being only a sudden gust of wind, has entirely differed the case: and no carrier is obliged to have a new carriage for every journey; it is sufficient if he provides one which (without any extraordinary accident, such as this was), will probably perform the journey.

In the case of Forward against Pittard, the plaintiff had delivered goods to the defendant, who was a common carrier; and which goods were afterwards destroyed by accident of fire. The question was, whether the defendant was answerable for them.

Lord Mansfield said, "It appears from all the cases, for one hundred years back, that there are events for which the carrier is liable, independent of his contract. By the nature of his contract, he is liable for all due care and diligence; and for any negligence, he is suable on his contract. But there is a farther degree of responsibility, by the custom of the realm; that is, by the common law, a carrier is in the nature of an insurer. It is laid down that he is liable for every accident, except by the act of God or the king's enemies: now, what is the act of God? I consider it to mean something in opposition to the act of man; for, every thing is the act of God that happens by his permission; every thing by his knowledge. But, to prevent litigation, collusion, and the necessity of going into circumstances impossible to be unravelled, the law presumes *against* the carrier, unless he shows it was done by the king's enemies, or by such act as could not happen by the intervention of man, as storms, lightning, and tempests.

"If an armed force come to rob the carrier of the goods, he is liable, and the reason is, for fear it may give room for collusion, that the master may contrive to be robbed on purpose, and share the spoil.

"In this case, it does not appear but that the fire arose from the act of some man or other: it certainly did arise from some act of man; for, it is expressly stated not to have happened by lightning. The carrier, therefore, is liable, inasmuch as he is liable for inevitable accident."—Judgment for the plaintiff.

And it has been said by Lord Kenyon, that there is a difference where a man is chargeable by the general law, and where on his own contract. Thus, as to common carriers, who are chargeable by operation of law, for all losses, (except those arising from the act of God or the king's enemies), they cannot discharge themselves from this responsibility by an act or agreement of their own. But, where a man is chargeable on his own

contract, he may qualify it as he thinks fit. Hyde, *v.* Proprietors of the Trent navigation. Trinity term, 33 Geo. III.

What acceptance makes a carrier liable.—Per King, C. J.—"If a box is delivered generally to a carrier, and he accepts it, he is answerable, though the party did not tell him there was money in it. But, if the carrier asks, and the other says no, or if he accepts it, conditionally, provided there is no money in it; in either of these cases, I hold, the carrier is not liable." And so it was afterwards determined in the court of King's Bench, in the case of Gibson, *v.* Poynton and another.

Goods lost in a lighter.—If goods are lost after the owner of them has taken them from the ship into a lighter, it is his own loss; but it is otherwise if the goods are sent from the ship by the ship's boat, which is considered as part of the ship and voyage. Yet, if the owner of any goods send his servant with them, the carrier or lighterman is not liable if they be lost.

Passengers dying on board.—If any passenger die on board, the master is obliged to inventory his effects; and, if no claim be made to them within a year, the master becomes proprietor of the goods, but answerable for them to the deceased's legal representatives. Bedding and furniture become the master's and his mate's, but the clothing must be brought to the masthead, and there appraised and distributed among the crew.

Captain dying.—If a captain die, leaving money on board, and the mate becoming captain, shall improve the money, he shall, on allowance for his care, account both for interest and profits.

A Master has no authority to sell the ship, unless in particular circumstances. The master possesses every power necessary for the employment and navigation of the ship; but he has not, unless in a case of extreme necessity, authority to sell the ship. In a case (*Johnson* v. *Shippen*) before the court of King's Bench, chief justice Holt is reported to have said, "The master has no authority to sell any part of the ship, and his sale transfers no property; but he may hypothecate," or *pawn*. In a subsequent case, (*Ekins* v. *East India Company*,) Lord Chancellor Cowper decreed that the East India Company should pay to the owner of a ship, *purchased of the master* at Batavia, for their use, and by one of their agents, the difference between the real value and the sum paid to the master, with the interest thereupon at the rate allowed in India. His lordship noticed that the sale of the ship was not *necessary;* and it appears that the transaction was a gross fraud between the master and the agent of the company, but without their privity. The decree was afterwards affirmed by the House of lords.

It has been quoted, from an old law reporter, that, "the master may, in some cases, sell the ship, although it does not belong

to him, as in the case of famine, &c. (*Jenkins' Centuries*, p. 165.) On this it has been remarked (*Abbott*, p. 3.) that the exception of cases of extreme necessity rather fortifies than weakens the general rule; and no person can safely purchase a ship of the master, in any case, which does not clearly fall within the principle upon which the exception is founded; and such a case will rarely happen. And, although the master be himself a part owner of the ship, yet will not his sale thereof be good for more than his own part; for the interest of part owners is so far distinct, that one of them cannot dispose of the share of another; whereas, in articles of ordinary sale, one partner may, in general, transfer the whole property, if the transaction be without fraud.

In the year 1805, the ship Glamorgan, of London, proceeded thence on a voyage to Antigua and back; she delivered her cargo at Antigua, took in her homeward-bound cargo, and, sailing to Tortola, to join convoy, arrived there in a leaky state on the 16th November, and was sold in the following month, under an order of the vice-admiralty court, obtained on the application of the master for a survey, and a report of surveyors that the ship was totally unfit, in her then state, to proceed with her cargo, and that the expense of repairing her would be more than her value when repaired. The purchaser procured a new register for the ship at Tortola, sent her thence to Nevis, there procured another new register, and sent her thence to the island of Granada, where she took in a cargo, with which she safely arrived in London, in July, 1806. No fraud was found to exist in this sale, and the court being of opinion that the sale could not be sustained under the authority of the vice-admiralty court, it became material to consider whether it could be sustained as a sale by the authority of the master. The court appear to have thought that it could not; but the point was not judicially decided, because the judges were of opinion that, supposing the master were warranted by an authority, express or implied, from his owner, to sell the ship in such a case, still it was necessary that the forms prescribed by the register acts should be complied with: and nothing of this sort having been done, the original owner succeeded in his action against the purchaser. (*Reid* v. *Darby*, 10 *East*, 143. As to the authority of the vice-admiralty court, to order a sale on the application of the master, See 10 *East*, 378.)

Again, the Fredonian, or American, ship *Fanny* and *Elmira* was captured by the Danes, recaptured by a British sloop, and claimed in the prize-court of admiralty, on behalf of her original owners, who resided at New York, and also by a Mr. Ormsby, who had purchased her of the master at Sligo in Ireland, under the following circumstances. The ship, having been

damaged upon the rocks in Sligo Bay, was surveyed by persons whom the master described as competent, but who do not appear to have filled any public station, and who reported that it would require 1500*l.* to repair the vessel, a sum far exceeding her value, and that it would be for the interest of the concerned to have her sold. She was accordiugly sold by public auction, and bought by Ormsby for 350*l.* The latter, by the master's desire, paid part of the money into the hands of the agents of the owner at Sligo, and carried the remainder to account between himself and the master. Soon after the purchase, Ormsby offered a fourth of the vessel to the master at the same price, provided he would consent to navigate her again as master: this he agreed to; the vessel was repaired at the expense of 800*l.*, sailed to Riga, and was taken on her return thence to London. The agents of the original owners declared that they had done all in their power to prevent the sale, and had been ready to make any advances that might be necessary. Upon this evidence the judge of the admiralty ordered the ship to be restored to the original owners, without prejudice to any rights which the proper court of justice in America might admit that Mr. Ormsby had acquired by the purchase. In this case, it is obvious that the sale could not be justified on the ground of necessity. Upon this subject *Sir Wm. Scott* said; "In the first place it must be shown that there was a necessity, and then it remains to be considered whether it was such as by law would give the master a right to sell. That such a case may arise, I am not prepared to deny; suppose, for instance, a ship in a foreign country, where there is no correspondent of the owners, and no money to be had on hypothecation to put her into repair. Under these circumstances what is to be done? the ship may rot before the master can hear from his owners; and, therefore, if the necessity were clearly shown, with full proof that every thing was done *optima fide*, and for the real benefit of the owners, the court might be disposed to sustain a purchase so made." And again, "In a case of that description, I say, strongly put, where there was no ground for suspicion, although I do not know that such a power is given to the master by the general maritime law, yet feeling its expediency, this court would strain hard to support the title of the purchaser; but there must be the *clearest proof of the necessity*: it must be shown, not only that the vessel was in want of repair, but likewise that it was impossible to procure the money for that purpose."

The effect, however, of these restrictions on a sale by the master, has been frequently evaded in foreign countries by procuring a sentence of condemnation and sale of a ship, as unfit for service, from some court or judge having jurisdiction in maritime affairs: but no such jurisdiction is known to the laws

of England. The condemnations made abroad, upon the survey and report of captains or carpenters, have no binding force in this country; but the fact, upon which they profess to be founded, may be again litigated by the parties interested in disputing it. This has been illustrated in a case, *Hayman* and others *versus Moulton* and others, in the sittings at Guildhall, Nov. 1, 1803, of which the following are the particulars.

The owners of the ship *Grace* sent her to Jamaica, under the command of a Mr. Cook, with a cargo consigned principally to M'Anuff and Cunningham, and with orders to follow their directions in respect to his loading back, and to apply to them for money for the use of the ship. On the 23d of February, 1802, after the discharge of her cargo, the ship was driven on shore at Rio Bueno, Jamaica, in a gale of wind. The master applied to Cunningham, who resided at Montego Bay, for advice in this emergency, and, on the 27th of February, made the usual protest. On the same day, the deputy naval officer at Montego Bay directed his warrant to four masters of ships, directing them to examine the *Grace*, and make a return upon oath of her state and condition. They reported that they had been on board, and found the ship settled in a sand bank four feet, with a bank of sand between her and the sea of twice her length, and not more than two feet water on the sand bank; and that they were therefore unanimously of opinion, from the great expense that would be incurred in attempting to get her afloat, and the little chance of succeeding therein, that it would be most for the advantage of the underwriters, and all others concerned, to sell the ship as she then lay, with all her materials, to the best bidder. *Cunningham* advertised the ship for sale by auction as a *wreck:* he acted as auctioneer, and charged his commission, and she was sold on the 15th of March, to one Dunn, for 1210*l.* Jamaica currency, or about 864*l.* sterling. One of the surveyors attended and bid at the sale. Dunn sold the vessel to Robert Moulton, a brother of one of the defendants, who, upon his own oath of ownership, and surrender of her register, obtained a new register at Jamaica, and transferred her there to the three defendants, one of whom was one of the four masters by whom she had been surveyed. The vessel was got off the sand with considerable difficulty, but very little injured; and, after some slight repairs, returned to England with a cargo. The ship had cost 3700*l.* before she left England, and was little more than three years old.

The owners being dissatisfied with this sale, brought the present action to try its validity; and, at the trial, it appeared by the evidence of Cook and of three of the masters who had surveyed the ship, that they had paid very little attention to the vessel itself, which was never pumped before they made their

report; but they swore that they thought a sale the most prupent step that could be taken, by reason of the difficulty, expense, and hazard, of removing her from her situation, and the little resources that Cook had for such a purpose. The plaintiffs contended that the master of a ship could not dispose of her in any case; or that, admitting him to have this power in a case of absolute necessity, this necessity did not exist in this instance, and the whole transaction was a gross fraud.

Lord Ellenborough, C. J. offered to reserve the question of the master's power to sell under any circumstances, for the consideration of the court, if the verdict should render that point material; and stated his own opinion to the jury to be, that, "although the master had no general authority to sell, he had an implied authority, in cases of extreme necessity, to act for the benefit of the concern, exercising a sound discretion, such as the owner himself would exercise if he were upon the spot; and that, in extreme cases, and such only, he had a power to sell, as in the instance of a wreck which could not be got off, and ought not to be left to perish absolutely. His lordship desired the jury to consider, whether, in this case, there was such a necessity as would have induced the owner himself to sell, if he had been present; and, if they thought there was a necessity, then, whether the sale in this instance, was fraudulent." The jury found a verdict for the plaintiffs.

The deputy naval officer noticed in the preceding case, is the deputy of an officer appointed by the governor of the colony, to receive an account of ships and cargoes upon arrival; and, in the course of the trial, no regard was paid to his authority; as, it appears, that his situation gives him no manner of jurisdiction on such a subject. In commenting upon the evidence, the chief justice adverted particularly to the circumstance of one of the surveyors having bid at the sale, and another become a purchaser before the ship left the island. He added that it might be a useful lesson to teach such persons, that, by accepting the office of surveyor, they elected not to become purchasers, or to derive any benefit from a sale.

At a subsequent trial, *Andrews* v. *Glover*, Sittings after Trinity Term, 46 Geo. III. at Guildhall, before Lord Ellenborough, C. J. brought to recover the value of a ship, which had been, in like manner, condemned and sold at Tobago, as incapable of repair, and in which also the plaintiff succceeded, the chief justice said, that "he considered a proceeding of this sort not as the sentence of a court, pronounced for the captors of a captured vessel, but rather as the inquisition of a sheriff, for the purpose of information to those who, under certain circumstances, have the power of selling the ship. Such an inquisition is not conclusive upon the party whose property is in question.

Finally, in the case of the ship Grace, the sale was considered to be fraudulent; but, in that of the Glamorgan, fair and well intended, and founded on the proceedings usual on such occasions, viz. a petition of the master to the court of vice admiralty for a survey, a commission of survey, report of surveyors, decree of the judge adopting the report, petition of the master for a sale, and a commission of sale, directed to the marshal of the court. Yet, in this case, the court of King's Bench decided that the vice-admiralty courts abroad have no authority to decree, upon the mere petition of the master, the sale of a ship reported upon survey to be unseaworthy, and not repairable, so as to carry its cargo to the place of destination without an expense exceeding the value of the ship when repaired.

An American Vessel sold in a foreign port must return her Register.

In case an American vessel should be sold in a foreign port, or otherwise left behind, the register must be returned. Where there is an American consul, it will be retained in his hands, which answers the same purpose. The owner gives heavy bonds at the custom house for the return of the register.

Penalty for not having a vessel's name on her stern.

There is a penalty of fifty dollars if the name should not be on the stern of an American vessel. The letters must be four inches long, white upon black, according to law.

The Hovering.

If any vessel should be seen laying off and on, near any port in Great Britain, for more than twenty four hours at one time, a cutter will be sent out to bring her into port, and she will be put under seizure, and if not condemned, will be heavily fined.

In 1809, I was in England, in the brig Sylph, when a vessel belonging to Norfolk, Virginia, was taken into Portsmouth, under the hovering act, detained, and obliged to pay upwards of three hundred pounds sterling before she could obtain a release.

Masters of ships to note a protest within twenty-four hours after their arrival at the port of destination.

It is the duty of the master, when he is arrived at his port of destination, to note a protest within twenty-four hours after his arrival: and if it be in the United States, a writ of survey must be taken out within the same time. This writ of survey must be given to one of the port surveyors; and if any goods should be damaged, the surveyor must be called to examine their stowage; otherwise the ship will be accountable for the

damaged goods. The surveyor must also be called on to see the hatches opened before bulk is broken.

It is also necessary that a commission for a survey be taken out in a foreign port, and the survey to be present when the hatches are taken off. This precaution may sometimes save trouble, as many have experienced.

Of Factors and Factorage.

A factor is one who acts for another, and who buys, sells, or negociates, conformably with the orders of his employer, under various circumstances of limitation.*

The factor generally receives, from the merchant or person by whom he is employed, a commission of factorage, according to the usage of the place where he resides, and the business he transacts. It is requisite that he keep strictly to the tenor of his orders, as a deviation from them, even in the most minute particular, exposes him to make ample satisfaction for any loss that may accrue from his non-observance.

The usual compensation to a factor is made by a commission of so much per cent. on the goods sold; but sometimes he acts under a *del credere* commission: or, for an additional premium beyond the usual commission, *he undertakes for the credit of the persons to whom he sells the goods* to him consigned. In the latter case, the undertaking, though verbal, is not affected by the statute against frauds, 29 Chas. II. c. 3., which, in general, invalidates any verbal undertaking to be responsible for the debt of a third person; and the factor is usually sued as if he himself were the purchaser.

Del Credere is an Italian mercantile phrase, which has the same signification as the English word *Guarantee*, and the Scottish word *Warrandice.*

A factor authorized to sell goods in his own name generally debits the buyer to himself; though, if money be not paid he is not liable to his principal for it (unless under a commission del credere;) yet he has a right to receive it, and his receipt is the proper discharge. The factor may bring his action, and the buyer cannot set off a former sum due to him from his principal. *Strange.* 1182.

* Factor, Broker, and Agent, are terms nearly synonymous; yet custom has created distinctions in applying these different names to particular distinctions of agency. Hence *Factor* appears to be exclusively applied to agents employed in the purchase or sale of goods. *Brokers* are generally factors, and employed also, in the shipping and money transactions of merchants and masters of ships. *Agents* have other distinctions, as those to the army and navy, who receive and advance pay or proceeds, on account of officers and others. The latter term, however, as it largely implies a person duly authorized to act for another, comprehends all the rest, and may therefore be indiscriminately applied to the whole.

A factor selling goods as his own, by indorsement of the bill of lading, though no delivery is made, the goods being at sea; the buyer shall keep possession, unless collusion appears between them. 2 *Burr.* 2046. 1 *Black. Rep.* 629.

A factor, empowered by general orders to dispose of goods to the best advantage, is bound to exercise that degree of diligence which a prudent man exercises in his own affairs. If it appears that he has done so, and sold the goods to persons in reputed good circumstances, and to whom he would have given credit on his sole account, he will not be liable, although some of these should fail. The factor, in this case, is generally paid by a commission of so much per cent. upon the goods sold, and is sure of his commission whether the event be favourable or otherwise. Hence, to preclude risk to the merchant, the agreement called *del credere* was invented, by which the factor, for an additional premium beyond the usual commission, when he sells the goods on credit, becomes bound to warrant the solvency of the purchaser. Lord Mansfield said (*Grove v. Dubois*, 1 *Term. Rep.* 115.) that a commission *del credere* was an absolute engagement to the principal from the broker (or *factor*) and made him liable in the first instance. Thus when a factor, under a commission *del credere*, sold goods and took accepted bills from the purchasers, which he indorsed to a banker, at the place of sale, and having received the banker's bill, (payable to the factor's own order,) on a house in London, indorsed and transmitted it to his employer, who got it accepted; it was holden that, on the failure of the acceptor and drawer of this bill the factor was answerable for the amount.

A sale by a factor creates a contract between the owner and buyer, although unknown to each other; and this rule holds even in cases where the factor acts upon a del credere commission. Hence, if a factor sells goods and the owner gives notice to the buyer to pay the price to him and not to the factor, the buyer will not be justified in afterwards paying the factor, and the owner will be entitled to recover the price in an action against the buyer, unless the factor has a lien on such price.

If goods are bought by a person as a broker, though without disclosing the name of the purchaser, until he has become insolvent, the purchaser thus knowing that the party acted as an agent, cannot set off the price of the goods against a debt due to him from the broker, but is still liable to the vendor.—But, when a factor, acting under a del credere commission, sells goods as his own, and the buyer does not know of any principal, the buyer may in an action brought against him by the principal set off a debt due to him from the factor.

The circumstance of persons selling goods being described

in the catalogue of sale as sworn brokers, is not sufficient notice to the purchaser that they are only agents in that transaction, to prevent him from dealing with them as principals: and, when goods are sold by a broker without disclosing his principal, the purchaser is justified in paying him in the same or in a different manner from that stipulated for by the terms of the contract; though it would be otherwise when the principal is disclosed at the time of sale. When, however, a factor sells goods as a principal, and before they are all delivered, or any part of them paid for, the purchaser is informed that they belong to a third person, in an action by the latter for the price of them, the purchaser cannot set off a debt due to him from the factor.

If a broker is authorized by one man to sell goods, and to buy such goods for another, an entry in his books of sale of these goods from the one to the other, signed by him, is in general a binding contract between the parties; the bought and sold note, which is a copy of this entry, is not sent to the parties for their approbation, but to inform them of the terms of the contract. The authority, however, of the broker may be countermanded at any time before a memorandum of the contract of sale is written and signed by him, pursuant to the statute against frauds, although he has previously entered into a verbal agreement to sell the goods.

In the city of London, if goods are sold by a broker, to be paid by a bill of exchange, the vendor has a right, within a reasonable time, if he is not satisfied with the sufficiency of the purchaser, to annul the contract. But the vendor must intimate his dissent so soon as he has had an opportunity to enquire into the solvency of the purchaser, and five days have been deemed too long for this purpose.

Should unlimited orders be given to a factor, he is left to buy or sell on the best conditions he can. If detriment occurs to his employers, the ready excuse will probably be that he acted for the best according to his prudence and judgment.

The factor being merely a trustee for his principal, if the latter, having goods in the other's hands, owes him money by simple contract, and then dies indebted by specialty, more than his assets are worth, the factor cannot retain the goods.

If a factor receives a commission merely to sell and dispose of goods, this will not enable him to trust: yet it is now held that he may sell on credit unless the usage of the trade be to the contrary.

A factor, as such, has not any authority to *pledge*, but only to sell, the goods of his principal. Hence, if the factor pledge the goods, the owner may recover the value of them in an action

of trover against him with whom they are pawned. If the factor pledges the goods as his own, the pawnee cannot claim to retain against the principal for the amount of the factor's general lien at the time of the pledge.

The same rule holds with respect to a bill of lading, which has been indorsed to a factor by his principal; for the bill of lading, which is the *symbol of the delivery of possession*, cannot give the factor a greater authority than the actual possession of the goods themselves. Hence, as a factor cannot pledge the goods, so neither can he pledge the bill of lading; for though the indorsement of a bill of lading gives the indorsee, or person to whom indorsed, an *irrevocable right to receive* the goods, yet it will not have that operation where it is intended as an assignment of the property in the goods, or where it is intended as a deposit only, by a person not authorized to make such deposit.

The maxim that the principal is civilly responsible for the acts of his agent, prevails universally in courts of law and equity: and, upon this principle, it was held by chief justice Holt that a merchant was answerable for the deceit of his factor who had sold some silk to the plaintiff as silk of a superior knowing it to be of an inferior quality.

The several merchants who employ the same factor must run the joint risk of his actions, although they are strangers to each other: thus, if five merchants remit to him five distinct bales of goods and the factor makes a joint sale of them to one man, who is to pay one moiety down, and the other at six months' end; if the buyer fails before the second payment, each merchant must bear a proportional share of the loss, and be content to accept of his dividend of the money advanced.

But if the factor draws a bill of exchange upon all those five merchants, and one of them accepts the same, the others shall not be obliged to make good the payment.

The authority and trust reposed in factors being very great, they ought to be very provident in their actions for the benefit of their principals. If a factor gives time to a man for payment of moneys contracted on sales of his employer's goods, and, after the time is elapsed, sell goods of his own to the same person for ready cash, leaving the other unpaid, and such man becomes insolvent, the factor ought to make good the loss; although he cannot be compelled by the law.

If goods are remitted to a factor, and he makes a false entry of them at the custom-house, or lands them without entry, whereby they incur seizure or forfeiture, he must make good the damage to his principal: but, if he makes his entry according to invoice or his letters of advice, and these prove erroneous, the goods are lost and he discharged.

The same probity expected from the factor is, by the law, expected from his employer, judging that the act of the one is that of the other; therefore, if a merchant consigns counterfeit jewels to his factor, who sells or disposes of them as if genuine; and incurs loss or damage thereby, the merchant shall not only make it good, but render such other satisfaction as may be adjudged. It is established that a principal shall answer for his factor in all cases; and, in contracts, if a factor buy goods on account of his principal, especially if accustomed to do so, the contract of the factor will compel the principal to a performance of the bargain.

The proceeds of goods sold by a factor must be carefully disposed of. If applied without the limits of his commission, or order, he becomes responsible. Conforming to this, if he be robbed, the act discharges him; and if he buy goods which afterwards suffer injury, the loss becomes that of the merchant. If the factor takes money that is false, he must make good the loss: but, if the money which he receives be afterwards lessened in value by edict or proclamation, the loss is that of the merchant.

The caution of the factor is particularly required to letters of credit: as to whether for a time limited, or to what value, &c.

It is now held that, if a merchant remit goods to his factor, and shortly after draws a bill on him, which is accepted, and he then breaks, the factor has a general lien upon all goods in his hands for the value of his acceptance, and whatever may be due to him.

Bills remitted to a factor are, while unpaid, considered as goods unsold; and, if the factor become bankrupt, must be returned to the principal, subject to the lien of the factor. *Black. Rep.* 1154. A factor has lien on consigned goods for incident charges, and also as an item of general account for balance due to him, so long as he keeps possession of them; if he parts with them, he parts with his lien. 1 *Burr.* 489. 1 *Black. Rep.* 104.

If a factor who enters into a charter party with a master for freightment personally covenants for the performance of it, he is obliged by the contract; but if he loads abroad generally, the goods, the principals, and the lading, are made liable, and not the factor.

If a factor possessing money belonging to his principal receives orders from him to make insurance on ships and goods so soon as he has loaded, and neglects to do so, he shall make good the damage that may accrue from such neglect. In case of loss he ought not to make a composition without orders from his principal.

Joint-factors are answerable for each other; and one may account without his companion.

A factor should be extremely punctual in the advices of his transactions, in sales, purchases, affreightments, and especially in drafts by exchange. If he sells on trust, without giving advice thereof, and the buyer breaks, he is liable to trouble for his neglect; and, if he draws without advising that he has so done, he may expect to have his bill returned protested. If he deviates from the orders he receives for purchasing goods, in any respect; or if, after they are bought, he sends them to a different place from that directed to, they must remain for his own account; unless the merchant, on advice, admits them. If he sells a commodity under the price ordered, he may be compelled to make good the difference; and, if on purchasing goods for another, at a price limited, the price rises, and he takes them for his own account, and sends them to another part, he will be obliged to satisfy his principal for damages.

Again, if a factor, in conformity with a merchant's orders, buys with his money or credit that which he shall be directed to purchase, and, without giving advice, sell it again to profit, appropriating the advantage to himself, the merchant may recover it from him and amerce him for the fraud.

If a merchant orders his factor to ship him a sum of money, in the current coin of a kingdom, when its exportation is prohibited, and the money is seized, the loss is the merchant's and not the factor's.

Lastly, if a factor pays the money of a merchant, without his orders, it is at his own risk; so, also, if he lends his cash without leave, although he proposes that the interest shall be for the merchant.

By the 5th Geo. II. c. 30, a factor may become bankrupt.

If both factor and consigner become bankrupt, the assignees of the factor have no property in the cargo, and cannot recover from the assignees of the merchant if the latter have sold it and received the purchase money. 1 Term Rep. 783. 4 Brown P. C. 8vo. 47.

Commercial agents are persons frequently appointed to settle accounts and dispose of the effects of merchants and other persons dying or failing in foreign countries or at home. Their commission terminates with the particular business for which they were engaged, and they generally give security for the trust reposed in them. Agents are likewise appointed by colonies and particular districts, to transact the public commercial concerns of the places from which they are deputed, with the officers of the mother country to which they belong. It is their duty to preserve the commercial rights and franchises of their principals, to present petitions against any proposed measures detrimental to their interest, and regularly to correspond upon

these subjects, and to consult and advise with the merchants and others interested in the countries where they reside. Such are, at present, the agents for our West India Islands and other settlements, whose public business lies chiefly with the Board of Trade and Plantations, and the Secretary of State for the colonies. Of such, also, is the factory of Canton, corresponding with the East India company.

SUPERCARGOES are persons employed by commercial companies, or private merchants, to take charge of the cargoes they export to foreign countries, to sell them there to the best advantage, and to purchase returning cargoes of the most advantageous kind. The supercargoes generally go out and return with the ships on board of which they were embarked, and therein differ from factors, who reside abroad at the settlements of the companies for which they act. The East India company send out supercargoes only to the places where they have no factories; and sometimes the chief supercargo remains at the place of a ship's destination some time, waiting the arrival or return of other ships, and acting as factor for the company.

SHIP'S HUSBANDS. The chief employment of this class of agents is in the principal sea-ports, especially London, where they purchase the ship's stores for her voyage, procure cargoes on freight, settle the terms and obtain policies of assurance, receive the amount of freight, pay the captain, or master, his salary and disbursements, and, finally make out an account of all these transactions for his employers, the owners of ships, to whom he may be considered as a steward on land, as the officer bearing that name is on board the ship, when at sea. His general commission is two per cent. on his accounts.

A more enlarged explanation of this subject may be found in *Lex Mercatoria*, 6th edition, Vol. I, p. 46 to 51, to which we are indebted chiefly for the preceding abstract.

Freight, Charter Party and Demurrage.

Freight is the sum agreed on or payable for the hire of a ship or carriage of goods; but the word *freight* is sometimes rather improperly used to signify the cargo or loading itself. In its former and more correct sense only it will be used in the course of this treatise.

The taking of a ship to freight is the hiring her from her master or owners, either in part or in the whole, by the month,

for an entire voyage, or by the ton. The contract, when reduced into writing, is called a *charter party;* but it may be done by a *verbal agreement* only.

What a charter party is.—A charter party is the same in the civil law as an indenture at common law. It settles the terms upon which the cargo is to be carried, as the bills of lading determine the contents of the cargo; the master or owners usually binding themselves, the ship, tackle, and furniture, that they shall be delivered (dangers of the seas excepted) well conditioned, at the place of discharge agreed upon. They likewise generally covenant to provide a sufficiency of tackle and mariners, and to fit the ship in every respect for performing the voyage. The merchant or freighter, on his part, stipulates to comply with the payment promised for freight on delivery of his goods: and both parties oblige themselves in penalties for non-performance.

Who may make a charter party.—A charter party may be made by the master, for *himself and owners:* in which case, the master may release the freighter without advising with the owners. But, if the owners let out to freight the ship, *whereof* J. J. *is master*, then, though the master covenant in the same charter party, and subscribe it, his release will not bind the owners; but the owners' release will include the master.

So likewise may a factor enter into a charter party. If the ship be only freighted outwards, and loaded by the factor, the goods shipped are alone liable for the freight: and no demand can be made on the freighters by virtue of the charter party: but the consignee of the goods is to pay the freight, according to the bills of lading.

How a verbal agreement will operate.—If there be a verbal agreement only, and *earnest* given, and the same be broken off by the merchant, according to the Rhodian law, he loses earnest: if the master or owners repent, they forfeit double. But, by the common law of England, either of the parties damnified may bring his action upon the case, and recover all the damages of the agreement.

Freight where no agreement.—Freight will however arise, not only by the terms of a charter party or verbal agreement, but by *common usage;* for, when goods are sent on board generally, such freight becomes payable as is customary for the like goods in similar voyages.

Cargo answerable for the freight.—The lading of the ship is *tacitly* bound for the freight, which, in point of payment, is preferred before all other debts to which the goods so laden are liable, although such debts, as to the time, were *precedent* to the freight; for the goods remain, as it were *bailed* to the master for the freight, nor can they be attached in his hands. But, as the

goods are bound to the ship for hire, so is the ship to the owner of the goods in case of damage or waste through the defect of the vessel or sailors.

A trading voyage.—If a ship is freighted from one port to another, and thence to a third, fourth, and so home to the port whence she first sailed, (commonly called a trading voyage,) this is all but *one* voyage: but must be performed conformably with the charter party or agreement.

Freight by the ton or parcels.—If a ship be freighted by the ton, and she is full laden according to the charter party, the freight is to be paid for her whole tonnage; otherwise, but for so many tons as the lading amounted to.

If the ship be named to be of a certain burthen, and shall be found less, there shall be no more paid than only for the number of tons actually laden on board.

If the burthen be expressed to be two hundred tons or *thereabout*, the addition of *thereabout* is commonly reduced to be within five tons, more or less.

If a ship, freighted by the ton or by parcels, be cast away, and part thereof is saved from the wreck, it has been doubted, whether *pro rata* freight should not be paid.

Freight by the great.—If a ship be freighted by the great, and her burthen be not expressed, yet the sum certain is to be paid.

If a burthen be expressed, and she be found not to amount to that burthen, yet the sum certain is to be paid.

If a ship, freighted by the great, be cast away, the freight is lost.

Freight by the month.—In freighting a ship by the month, calendar months are meant; and thus it is always calculated by the merchants of London. Jolly *v.* Young, Trinity Term, 34 Geo. III.

In case a ship be freighted at the rate of 20*l.* for every month that she shall be out, to be paid after arrival at the port of London, and the ship be cast away coming up from the Downs, but the lading is all preserved, freight becomes due; for the money arises monthly by the contract, and the place mentioned is only to show where payment is to be made. The freight becomes due on the delivery or bringing up of the commodities, and not the ship, to the port of London.

Freight for the voyage out.—If a ship be freighted out, and the master covenants that the ship should sail out of the port to Cadiz with the first fair wind and opportunity, and the freighter covenants, that, for the freight of all the premises, he would pay unto the master 184*l.*, if the master do not show that the ship arrived at Cadiz, he cannot recover the freight. The reason of this seems to be that, by the special terms of the contract, the

master was in the nature of an insurer for the amount of the freight agreed on.

A contract is made, between a merchant and a master of a ship, that, if he carries the merchant's goods to such a port, he will then pay him so much money for freight. In making the voyage the ship is robbed by pirates, and part of her loading lost, and afterwards the remainder is brought to the port of discharge. Here the sum agreed on for freight is not due, the agreement not being performed on the part of the master; and this is a conditional contract. But it is otherwise by the civil law: for thereby the same is a danger of the seas, which, if not expressed in naval agreements, is naturally implied: and there was no default in the master or his mariners; and, had these goods, which the pirates carried away, been thrown overboard, it would not have worked a disability in the master to receive the sum agreed on: because, both by the common law and law of marine, the act of God, or that of an enemy, shall not have an effect to work wrong in actions private; and a pirate is esteemed an enemy in our law.

Freight out and home.—When a ship is freighted *out* and *in*, (or *out* and *home*) there is no freight due till the whole voyage be performed: so that, if she be cast away coming home, the freight *outwards* as well as *inwards* becomes lost.

Freight for passengers.—If freight be contracted for the transporting of women, and they happen in the voyage to be delivered of children, no freight becomes due for the infants.

A master of a ship is not bound to answer freight to the owners for passengers, where it appears that they are not able to pay.

Freight for cattle.—If freight be agreed on for a lading of certain cattle, or the like, from Dublin to West Chester, and some of them happen to die before the ship's arrival, the whole freight is become due, as well for the dead as the living. But, if the contract be to transport them at so much *per* head, freight will become due only for such as are living at the ship's port of discharge.

When cattle are sent on board, without any previous agreement about transporting them, but generally, their freight is payable for the dead as well the living.

Freight for wine when it has leaked.—If freight be taken for a hundred tuns of wine, and twenty of them leak out, so that there is not above eight inches from the bulge upwards, yet the freight becomes due; but, if they be under eight inches, some conceive it then to be in the election of the freighters to fling them up to the master for freight, but most think otherwise; for, if all had leaked out, if there was no fault found in the stowage, by a survey from the Trinity House, there is no reason the ship

should lose her freight; for the freight arises from the tonnage taken; and, if the leakage was occasioned through storm, the same, perhaps, may come into an average. Masters should take care to make their regular protests of a storm, as they may suffer severely by omitting it.

Of the performance of the charter party by the freighter.—If, by the time appointed in the charter party, the freighter is not ready to load, the parties are at liberty; and the suffering one hath his remedy by action for the same.—*Buckle* v. *Atkinson.*

If part of the loading be on board, and some intervening misfortune prevent the merchant from shipping the whole in time, the master is at liberty to contract with another, and shall have freight, by way of damage, for the time that those goods were on board after that limited. For, a failure as to a complete loading will end the contract, unless afterwards *affirmed by consent.* And, though it be not prudent for a merchant or master to depart from the contract on every non-compliance with its terms, yet it is the highest justice that ships and masters should, in such cases, remain free: for, otherwise, by the bare lading of a cask or bale, they might be defeated of the opportunity of passage or the season of the year.

If goods are fully laden on board, and the ship hath *broken ground*, and the merchant determines again to unload them, and not to prosecute the adventure, by the *marine law* the freight is due.

Where no freight was to be paid for the cargo *outwards*, but freight for the cargo *homewards*, and the freighter's factor abroad had no goods to load on board of her, payment of the freight was decreed.

If a ship be freighted out and home, and deliver her cargo at the place agreed on, or if a ship be freighted to go to any place to load, and arrive there, and the freighter's factor cannot or will not put any thing on board, the master must stay the days of demurrage agreed on by the charter party, and make a regular protest for his freighter's non-compliance, who will, in this case, be obliged to pay him, empty or full; though, should the master not wait the time stipulated, or omit to make his protest, he will lose his freight. In case the master, on his finding no goods provided, should load some on his own account, as salt or the like, this will not prevent his recovering the freight; but, if the master take in such salt, on his own account, before the days of demurrage are expired, and that, by some condition with the freighter, he may still claim freight, then the freighter is to have the benefit of the salt, in deduction of the said freight.

If a freighter, by loading prohibited or unlawful goods, occasions the ship's detention, or otherwise impedes the voyage, he will have to pay the freight agreed for.

Of performance of the charter party by the master or owner.—If, by the time appointed in the charter party, the ship is not ready to take in, the parties are at liberty; and the suffering one hath his remedy against the other, by action, to recompense the damages.

If part of the goods be on board, and some intervening misfortune prevent the master from taking in the remainder, the merchant may ship them on board another, discharge the first, and recover damages against the master and owners for the rest.

If the ship in her voyage become unable, without the master's fault, or that the master or ship be arrested by any foreign prince or state in her voyage, the master may either *mend his ship, or freight another;* but, if the merchant will not consent thereto, then the *freight* becomes due for so much as the ship hath *earned;* otherwise the master is liable for all damages that shall happen: and therefore, if that ship, to which the goods were translated, perish, the master shall answer; but, if both ships perish, then he is discharged. But, in case of extreme necessity, as that the ship would be in a sinking condition, and an empty ship is passing by or at hand, he may translate the goods; but if that ship sinks or perishes, he is there excused; but then it must be apparent that the ship seemed *probable* and *sufficient.*

If a master shall weigh anchor and sail after the time covenanted or agreed for his departure, if any damage happens at sea after that time, he shall refund and make good all such misfortune. Yet, if a *charter party* be made, that the plaintiff shall sail from London to Lisbon with the first fair wind and opportunity, &c., in consideration of which the merchant did covenant to pay so much for freight, and the ship departs not with the first fair wind and opportunity, yet afterwards *breaks ground* and arrives at her port, the freight in this case is become due; and there is nothing can debar the ship of her freight but non-departure; for only that in law is material to avoid payment of the freight; but to say the ship did not depart with the next wind is but a circumstance, which, in strictness of law, is not necessary to be denied.

If it be agreed, that the master shall sail from London to Leghorn in two months, and freight accordingly is agreed on, if he begins the voyage within two months, though he does not arrive at Leghorn within the time, yet the freight is become due.

The East India company might, by charter party, keep a ship they had freighted a long time in India, and did so keep her until she was unfit for service, and could not come home: they were obliged in chancery to pay the damage, though, by the charter party, it was payable at the return of the ship.

If a master lets out his ship. and afterwards secretly takes in other goods unknown to the first freighter, by law marine, he loses his freight; and, if it should so fall out that any of the freighter's goods should, for safety of the ship, be thrown overboard, the rest shall not become subject to average, but the master shall make the damage good; though, if the goods should be brought into the ship secretly and unknown to him, it is otherwise; and goods so brought in may be subject to what freight the master thinks fit.

When a ship puts into any other port than that she was bound to by agreement, the master shall answer all damages that shall accrue thereby: but, if she was forced in by storm, enemies, or pirates, he must afterwards proceed to that he was obliged to by contract.

If a ship in her voyage happens to be taken by an enemy, and afterwards is retaken by another ship in amity, and restitution is made, and she proceeds on in her voyage, the contract is not determined, though the taking by the enemy divested the property out of the owners; yet by the law of war, that possession was defeasible; and, being recovered in battle afterwards, the owners became reinvested: so the contract, by fiction of law, became as if she never had been taken, and the entire freight becomes due.

It was covenanted, by a charter party, that a ship should return by a certain time within the river Thames, (the danger of the sea excepted,) and afterwards in the voyage, and within the time of the return, the ship was *taken* upon the sea by enemies unknown to the covenanter; and, being detained by them, could not return within the river Thames within the time mentioned by the covenant:—*Resolved*, This impediment was within the exception; for, these words intend as well as any danger upon the sea, by pirates or men of war, as dangers of the sea by shipwreck, tempest, or the like.

How an embargo will end a charter party.—If before the departure of the ship, there should happen an embargo, occasioned by war, reprisals, or otherwise, with the country to which the ship is bound, so that she cannot proceed on her voyage, the *charter party* shall be dissolved without damages or charges to either party, and the merchant shall pay the charges of unlading his goods; but, if the restraint arises from a difference between the parties themselves, the *charter party* shall still remain valid in all points.

If the ports be only shut, and the vessels stopped for a time, the *charter party* shall still be valid, and the master and merchant shall be reciprocally obliged to wait the opening of the ports, and the liberty of the ships, without any pretensions for damages on either side.

However, the merchant, at his own charges, may unlade his goods during shutting up of the port, upon condition either to relade them, or indemnify the master.

Form of a Charter Party of Affreightment.

This charter party, indented, made, &c., between A. B., &c., mariner, master, and owner, of the good ship or vessel, called, &c., now riding at anchor at, &c., of the burthen of two hundred tons, or thereabout, of the one part, and C. D., of, &c., merchant, of the other part, witnesseth, that the said A. B., for the consideration hereinafter mentioned, hath granted, and to freight letten, and by these presents doth grant, and to freight let, unto the said C. D., his executors, administrators, and assigns, the whole tonnage of the hold, stern-sheets, and half-deck, of the said ship or vessel called, &c., from the port of London, to, &c., in a voyage to be made by the said A. B. with the said ship, in manner hereinafter mentioned, (that is to say,) to sail with the first fair wind and weather that shall happen after, &c., next, from the port of London, with the goods and merchandise of the said C. D., his factors or assigns, on board, to, &c., aforesaid, (the danger of the sea excepted,) and there unlade and make discharge of the said goods and merchandises; and also shall there take into and on board the said ship again, the goods and merchandise of the said C. D., his factors or assigns, and shall then return to the port of London, with the said goods, in the space of, &c., limited for the end of the said voyage. In consideration whereof, the said C. D., for himself, his executors, and administrators, doth covenant, promise, and grant, to and with the said A. B., his executors, administrators, or assigns, by these presents, that the said C. D., his executors, administrators, factors, or assigns, shall and will well and truly pay, or cause to be paid, unto the said A. B., his executors, administrators, or assigns, for the freight of the said ship and goods, the sum of, &c., (or so much per ton) within twenty-one days after the said ship arrived, and goods returned, and discharged at the port of London aforesaid, for the end of the said voyage; and also shall and will pay for demurrage, (if any shall be by default of him, the said C. D., his factors, or assigns,) the sum of, &c., per day, daily, and every day, as the same shall grow due. And the said A. B., for himself, his executors, and administrators, doth covenant, promise and grant, to and with the said C. D., his executors, administrators, and assigns, by these presents, that the said ship or vessel shall be ready at the port of London to take in goods by the said C. D., on or before, &c., next coming. And the said C. D., for himself, his, &c., doth covenant and promise, within ten days after the said ship or vessel shall be

thus ready, to have his goods put on board the said ship, to proceed on in the said voyage; and also, on arrival of the said ship at, &c., within, &c., days to have his goods ready to put on board the said ship, to return on the said voyage. And the said A. B. for himself, his executors, and administrators, doth further covenant and grant, to and with the said C. D., his executors, administrators, and assigns, that the said ship or vessel now is, and at all times during the voyage shall be, to the best endeavours of him, the said A. B., his executors, and administrators, and at his and their own proper cost and charges, in all things made and kept stiff, staunch, strong, well apparelled, furnished, and provided, as well with men and mariners sufficient and able to sail, guide, and govern, the said ship, as with all manner of rigging, boats, tackle, and apparel, furniture, provision, and appurtenances, fitting and necessary for the said men and mariners, and for the said ship during the voyage aforesaid. In witness, &c.

The following is the Form of a Charter party, whereby the Owners of one Moiety of a Ship let to freight their Share to the Owners of the other Moiety.

This charter party, indented, made, &c., between A. B. and C. D., of London, merchants, owners of one moiety, or half-part, of the good ship or vessel called the Neptune, of the burthen of 200 tons, with the like moiety of all the sails, masts, tackle, apparel, furniture, ordnance, and appurtenances, thereto belonging, riding at anchor in the River Thames, within the port of London, of which the said C. D. is master, of the one part, E. F. and G. H., of London, merchants, owners of the other moiety and residue of the said ship with the masts, sails, tackle, ordnance, furniture, and apparel, thereunto belonging, on the other part, witnesseth, that the said A. B. and C. D., have granted and letten to freight, and by these presents do grant and let to freight, all their said part and moiety of the said ship and premises, unto the said E, F. and G. H., for a voyage with her (by God's grace) to be made in the manner and form following:

That is to say, that the said A. B. and C. D. for them, their executors, administrators and assigns, do hereby covenant and grant, to and with the said E. F. and G. H., for them, their and either of their executors, and administrators, by these presents, that the said ship (being already laden) shall, with the first good wind and weather after the date hereof, (God permitting,) sail directly from the said river Thames to the port of Leghorn, in Italy, (the perils and dangers of the seas excepted,) and there discharge such goods and merchandises as shall be directed and

appointed by the said E. F. and G. H., or one of them, their or one of their factors and assigns; and thence shall sail, and take her direct course, as wind and weather shall serve, with as much speed as may be, (the perils and dangers of the seas excepted,) to Venice, and there shall stay and abide the space of forty working days next after her first arrival there, to unlade all such goods and merchandises as shall remain on board for account of E. F. and G. H., after her delivery at Leghorn, as aforesaid; and to relade such goods, wares and merchandises, as the said E. F. and G. H., or either of them, their or either of their factors or assigns, shall think fit to charge and relade on board and into the same ship, that is to say, so much as the said ship can conveniently carry, over and above her victuals, tackle, ammunition, apparel, and furniture.

And the said ship with her said loading shall with the first good wind and weather after the expiration of the said forty days, sail and proceed from the said city of Venice to London. And the said E. F. and G. H., for themselves and either of them, their and either of their executors and administrators, do covenant, promise, and grant, to and with the said A. B and and C. D., and either of them, their and either of their executors, administrators, or assigns, by these presents, that they, the said E. F. and G. H., or one of them, or their or one of their executors, administrators, or assigns, shall and will well and truly pay, or cause to be paid, to the said A. B. and C. D., or one of them, their or one of their executors or administrators, within the said city of London, for every ton of such wares and merchandises as shall be laden or unladen in the said ship, during the said voyage, the sum of, &c., (counting the tonnage according to custom, or if a certain sum is agreed on for the voyage out and home, or so much per month,) for the part and interest of the said A. B. and C. D. in the said ship, and for, and in respect of, the freight and hire of their part of her: which said money is to be paid in manner and form following; that is to say, one third part thereof upon the right discharge of the said ship, and another third part thereof within the space of six weeks then next following, and the remaining third part thereof within the space of two months next ensuing after the end and determination of the said six weeks.

And the said A. B. and C. D., for them and either of them, their and either of their executors and administrators, do covenant and grant to and with the said E. F. and G. H., their executors and administrators, by these presents, that the said ship for their part, shall be strong and staunch, and well and sufficiently tackled and appareled with sails, sailyards, anchors, cables, ropes, gunshot, artillery, gunpowder, and all other instruments, tackle, and apparel, needful and necessary for such a

ship, and for such a voyage, together with an able master and sufficient number of mariners.

And in the performance of all and every the covenants, grants, articles, and agreements, on the parts and behalfs of every of the said parties, truly to be holden, performed and kept, in all things as is aforesaid, the said parties to these presents do bind themselves to one another, that is to say, the said A. B. and C. D. do, by these presents, bind themselves, and either of them, and their executors and administrators, goods, and their part and interest in the said ship, with the furniture thereof, to the said E. F. and G. H., and to their executors and administrators; and the said E. F. and G. H. do in like manner bind themselves, and either of them, their and either of their executors, administrators and assigns, and all their goods and interest in the said ship, to the said A. B. and C. D., their executors and administrators, in the sum or penalty of one thousand pounds of lawful money of Great Britain, by the party or parties infringing the said covenants, or any of them, to the other party or parties truly observing, to be paid by virtue of these presents.

The great variety of circumstances occasioned by different voyages naturally produce a correspondent diversity in charter parties, all the different forms of which it would be impracticable and unnecessary to introduce, as the preceding may be varied to suit any purpose.

The difference between a bill of lading and a charter party is, that the first is required and given for a single article or more, laden on board a ship that has sundry merchandise shipped for sundry accounts. Whereas a charter party is a contract for the whole ship. Bills of lading ought to be signed by the master within twenty-four hours after the delivery of the goods on board. But upon delivery of the goods, the master, or other person officiating for the master in his absence, is to give a common receipt for them, which is to be delivered up, upon the master signing the bill of lading.

Upon delivering the goods at the port of destination to the shipper's factors or assigns, giving up the bill of lading sent to the factors or assigns is a sufficient discharge, but the master may insist on a receipt.

Demurrage.

Demurrage is an allowance made to the master of a ship by the freighters, for staying longer in a place than the time first appointed for his departure, and is generally inserted in the charter party, to be paid daily as it becomes due. The days are always limited, so that, on the expiration thereof, a protest must be made, and the master is at liberty to proceed as before

mentioned. The stipulation for the payment of demurrage, while a ship is waiting for cargo, ceases when the ship is fully laden, although the ship be afterwards detained by head winds or stormy weather.

The word *lay-days*, used alone in a clause of demurrage, is to be understood to mean working days only.

Many losses have frequently fallen upon owners of ships, from want of proper care being taken by their captains in signing bills of lading. When there is the least reason to suspect the quantity is not right, or that there is any damage in the goods, always write,

(If hemp, flax, bars of iron, &c.)

Quantity and conditions unknown: and three bundles of hemp in dispute: if on board, to be delivered. *Thomas Smith.*

(If linens, yarns, bales, hardware, &c.)

Insides and contents unknown to *Thomas Smith.*

(If tar, wines, brandy, turpentine, &c.)

Contents and conditions unknown; not to be accountable for leakage: and it is agreed that the freight shall be paid for the quantity shipped. *Thomas Smith.*

QUARANTINE LAW,

PASSED JANUARY 29, 1818.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General assembly met, and it is hereby enacted by the authority of the same,* That from and after the first Monday in March next, a Board of Health shall be established in the manner hereinafter directed, which shall be and hereby is erected in a body corporate, in deed and in law, by the name, style, and title of, "The Board of Health," who shall have perpetual succession and enjoy all and every the rights, liberties, and privileges, powers, authorities, and immunities, incident or belonging to a corporation or body politic; and by that name may take and hold all the estate real and personal now vested in the present Board of Health, and shall moreover have and exercise the powers and authorities hereinafter mentioned, that is to say: The members of the Board of Health shall be eleven, who shall serve without compensation or emolument, and shall be appointed in the manner following, to wit: The Select and Common Councils of the city of Philadelphia, in a joint meeting to be held on the afternoon of the second Monday in March, annually, between the hours of two and six o'clock, shall elect by ballot, six citizens, who shall be taxable inhabitants of the said city; and the commissioners of the incorporated part of the Northern Liberties shall annually on the same day, and between the same hours, elect by ballot, two citizens, who shall be taxable inhabitants of the said district; and the commissioners of Penn township shall annually, on the same day, and between the same hours, elect by ballot one citizen, who shall be a taxable inhabitant of the said district; and the commissioners of the district of Southwark shall, annually, on the same day and between the same hours, elect by ballot one citizen, who shall be a taxable inhabitant of the said district; and the commissioners of Moyamensing shall, annually, on the same day, and between the same hours, elect by ballot one citizen, who shall be a taxable inhabitant of the

said township, who shall constitute the Board of Health, of which a majority shall be a quorum. And in case the appointments hereby directed should not take place on the day specified, they may be made on any other subsequent day prior to the third Monday in March, between the same hours; and the number of years for which any individual may be eligible as a member of the Board of Health, shall not be limited; and in case of the removal, death, sickness, resignation, inability, or refusal to serve, of any of the said Board, their places shall be supplied by other appointments to be made by the same authority which appointed the individuals by whose delinquency the vacancies shall be occasioned. And the said Board, out of their own body, shall choose a President, who shall preside at the meetings of the Board, and whose place shall be supplied in his absence by the appointment of a chairman for the time; a Secretary, whose duty it shall be to keep fair minutes of all the proceedings, rules, and regulations of the Board; and a Treasurer, who shall give bond with sureties as is required of the county treasurer, who shall receive all monies belonging to the corporation, and pay and disburse the same upon the order of the Board, signed by the President and attested by the Secretary, who shall keep fair and just accounts of his receipts and expenditures, and make extracts thereof whenever the Board shall require the same; and shall once in every year, his accounts having been allowed by the Board, publish the same in one or more newspapers of the city of Philadelphia. And the said Board shall sit upon their own adjournment as they shall find necessary, but shall meet at least once in every day between the first day of June and first day of October in every year; and also when the Board shall be specially convened by order of the President or any two of the members. And the said Board shall have and hereby is vested with full power and authority to make general rules, orders, and regulations, for the government and management of the Lazaretto, and the vessels, cargoes, and persons there detained, or under quarantine, and of the Health Office and public hospitals, and for the mode of visiting and examining vessels, persons, goods, and houses; and shall also have power to appoint such officers and servants as may be necessary to attend the Health Office, the Lazaretto, and the City Hospital, and convey communications and supplies to the said Lazaretto and Hospital, and such other officers and servants as may be necessary for the preservation of the health of the district; together with all temporary officers and servants that may be rendered necessary by the existence of any dangerous, contagious disease in the city of Philadelphia, or in any other place within the United States: *Provided*, that such officers and servants shall not hold any offices of profit or trust under

the United States; and to remove any of the officers or servants by them appointed, and to appoint others in their places, and to allow and pay the said officers and servants so appointed, such compensation for their respective services as the said Board shall deem just and proper. And the governor is hereby authorized and required to appoint one physician, who shall reside at the Lazaretto, and be denominated the Lazaretto physician, and one physician, who shall reside in the city of Philadelphia, and shall be denominated the Port physician, one health officer, and one quarantine master, all of whom shall be under the direction and controul of the Board of Health, and shall be removed from office by the governor at the request of the majority of the members of the Board of Health; and the said Lazaretto physician shall be entitled to occupy the house hitherto occupied by the resident physician, and shall also be provided by the Board of Health with ground for a garden within the bounds of the Lazaretto, of such extent as the Board may think proper; and the quarantine master shall be entitled to occupy the house hitherto occupied by the quarantine master, and shall also be provided by the Board of Health, with ground for a garden, within the bounds of the Lazaretto, of such extent as the Board shall think proper.

SECT. 2. *And be it further enacted by the authority aforesaid,* That the Health Officer, on receiving from the captain or master of any ship or vessel, the certificate as directed by this act, or where no certificate is to be given on the arrival of the vessel, shall be entitled to receive from the captain or master, the following sums and no more, and to pay the same over from time to time as the Board may direct to the treasurer of the Board of Health, to wit: All American vessels sailing under coasting documents, arriving at the port of Philadelphia, from any port or place in the United States, between the river St. Croix and the river St. Mary, (except ports or places between Sandy Hook and Cape Charles) shall pay two dollars and fifty cents for each arrival, during quarantine months, and the said vessels during that time shall (if having goods capable of containing contagion, persons, baggage or cloathing, from any foreign port or place, or any diseased person) stop at the Lazaretto, and there be examined by the Lazaretto physician and quarantine master, under the rules, regulations and penalties in this act contained. And all American vessels from any port in the United States where they may have touched or traded from a foreign port or place, shall pay the same sum as if they had arrived direct from such port or place. And all American vessels with coasting documents, arriving from any port or place between Sandy Hook and Cape Charles, including the bay and river Delaware, during quarantine months, having on board

merchandise of foreign growth or manufacture, or persons, baggage or cloathing, from any foreign port or place, or from any place to the northward or eastward of Sandy Hook, or westward of Cape Charles, shall stop at the Lazaretto for examination, under the rules, regulations and penalties in this act contained, and shall pay for each arrival during quarantine months two dollars and fifty cents. All American vessels arriving from any port or place in New Brunswick, Nova Scotia, Canada, or the islands or ports adjacent to the river St. Mary's, the coast of Florida, Bay of Mexico, including New Orleans and parts adjacent, and from thence along the Bay of Honduras and coast of Terra Firma, as far as the river Amazon, including all the islands generally denominated West India, Bahamas or Bermudas, shall pay on arrival five dollars. All American vessels arriving from any place in Europe, in the Western Madeira, Canary or Cape Verd islands, the west coast of Africa as far as latitude thirty-four degrees south, and from any place in the Mediterranean or straights thereof, or from any place from the river Amazon inclusive, and round the coast of Brazils as far as latitude thirty-four degrees south, shall pay ten dollars each. And all American vessels arriving from any place beyond latitude thirty-four degrees south, or round Cape Horn, or the Cape of Good Hope, shall pay twenty dollars each. And all foreign vessels arriving as aforesaid, (except prizes to American vessels,) shall pay twenty-five per cent. each additional, unless otherwise regulated by any treaty. And prize vessels taken by foreign armed vessels, shall pay twenty-five per cent. each, more than is paid by American vessels. And prize vessels taken by American vessels, shall pay on arrival ten dollars each. And public armed vessels and privateers, shall pay six dollars each. And any vessel of the burthen of one hundred and fifty tons and upwards, arriving at the Lazaretto, from any foreign port or coastwise, may come to in the outer channel, as near to the west end of the island of Little Tinicum, opposite the Lazaretto, as her draft of water, wind and weather, will permit, for the purpose of receiving the visit from the Lazaretto physician and quarantine master, and if the said vessel does not receive her visit in the inner channel, she shall pay an additional sum of five dollars, of which two dollars shall be paid to the Lazaretto physician, and one dollar to the quarantine master, as a compensation for their extraordinary services, and two dollars shall be paid into the treasury of the Board.

SECT. 3. *And be it further enacted by the authority aforesaid,* That the building now called the Lazaretto, and the ground therewith reserved and occupied, and all the property and estate of every kind whatsoever now vested in the present Board of Health, shall become and be fully vested in the Board of Health

constituted by this act, immediately, and as soon as the same shall be organized for the uses and purposes for which the said Board is instituted and established, and the same shall be fully and entirely under the direction and management of the said Board; and the said Board shall have power to erect such buildings, and to make such inclosures on the lot or tract adjoining the Lazaretto, as to them may seem proper and necessary.

SECT. 4. *And be it further enacted by the authority aforesaid,* That from and after the passing of this act, every ship or vessel coming from any foreign port or place bound to the port of Philadelphia, between the first day of June and the first day of October in every year, shall come to anchor in the river Delaware as near the Lazaretto as the draught of water and the weather will allow, before any part of the cargo or baggage be landed, or any person who came in such ship or vessel shall leave her, or any person be permitted to go on board, and shall submit to the examination hereinafter directed; and if any master, commander, or pilot, shall leave his station before the said Lazaretto, or if any master or commander shall permit or suffer any part of the cargo or baggage, or any person or persons arriving in such ship or vessel from any port beyond the limits of the United States, to be landed on either shore of the Delaware bay, or river, or suffer any person, except the pilot, to come on board before such examination be duly had, and a certificate obtained as is hereinafter specified, the person or persons so permitting, and the person or persons so landed or going on board (unless imminent danger of the loss of the vessel or lives of the crew shall render assistance necessary,) being thereof convicted, upon indictment or prosecution under this act by verdict, confession, or standing mute in any court having jurisdiction of the offence, shall pay a fine not exceeding five hundred dollars, to be recovered and appropriated as is herein directed; and it shall be the duty of the Lazaretto physician and quarantine master, so soon as any ship or vessel shall be anchored near the Lazaretto, between sunrise and sunset, immediately, wind and weather permitting, to go on board the same, and there thoroughly examine in such form and manner as shall be prescribed by the Board of Health, the said ship or vessel, the crew, passengers, cargo, and baggage on board the same, and to demand answers under oath or affirmation to be administered by either the said physician or quarantine master, who are hereby severally empowered to administer the same, to all such questions as shall be put to any person on board such ship or vessel touching the health of the crew and passengers during the voyage, and the nature and state of the cargo as the Board of Health by their rules shall from time to time direct to be asked; but it shall be the duty of the person so examin-

ing on oath or affirmation, before he shall proceed therein to make known to the person interrogated the penalty imposed by this act upon the person who shall give false answers under oath or affirmation to the questions proposed in such examination, and if upon such examination it shall appear to the said physician and quarantine master that the said ship or vessel came from a port or place at which no malignant or contagious disease prevailed at the time of her departure, that the persons on board such ship or vessel are free from every pestilential or contagious disease, (the small pox and measles excepted,) and that the said vessel has had no malignant disease on board either during the homeward bound voyage or during her continuance in a foreign port, and they shall see no cause to suspect that the cargo or any part thereof is infected, they shall forthwith deliver to the master or captain of such ship or vessel a certificate of the facts in such form as shall be directed by the Board of Health, and the said captain or master may thereupon proceed according to his destination, and shall present such certificate at the Health Office in Philadelphia within twenty four hours after his arrival and safely mooring there; but if it shall appear upon such examination that the ship or vessel came from a port or place at which a malignant or contagious disease prevailed, such vessel shall be detained at the Lazaretto for such time as the Board of Health shall deem necessary, not exceeding twenty days; and the letter bag of the vessel when purified, and such letters as the master, commander, or passengers, shall think proper to write to their owners, consignees, or friends, shall be transmitted to the Health Office in Philadelphia, who shall safely deposit the same in the post office. And thereupon the Board of Health shall determine and direct what measures shall be pursued to cleanse the vessel and cargo, purify the clothing and baggage, and restore the health of diseased persons on board, which direction shall be carried into execution under the inspection of the Lazaretto physician and quarantine master, at the expense of the master, owners, or consignees, of the vessel and goods respectively, in such manner as by the said orders shall be directed: *Provided always*, That wine, rum, salt, sugar, spirits, molasses, mahogany, manufactured tobacco, dye woods, preserved fruits, and such other articles as the Board of Health shall by their general regulations specify and permit, may be conveyed immediately to the city in lighters; and at the expiration of the said time if it shall appear to the said physician and quarantine master, that no person has been sick with a malignant or contagious disease, (the small pox and measles excepted,) on board said ship or vessel, either during the voyage homeward, or during her continuance in a foreign port, nor any of the crew or passengers, or other person from on board such

vessel during the performance of quarantine, and the said physician and quarantine master shall certify the said facts to the Board of Health; and that in their opinion the vessel, crew, cargo, and passengers, may be safely suffered to proceed to the city, the said captain or master may proceed with the same according to his destination, unless the Board of Health shall deem it necessary to cause a further detention of the said vessel or cargo, or of the crew or passengers, or of any baggage on board said vessel, in which case the same shall be detained until the Board of Health shall authorize the same to proceed and enter the city; and upon the arrival of the said captain or master at Philadelphia, he shall present the said certificate of the physician and quarantine master at the Health Office within twenty four hours after his arrival; but if upon examination of any vessel by the said physician and quarantine master as aforesaid, or during the performance of quarantine by any vessel, it shall appear to the said physician and quarantine master that there has been any person sick on board the said vessel with any malignant or contagious disease, either during the voyage homeward, or during the continuance of the vessel in a foreign port, or during the performance of quarantine at the Lazaretto, (or that any person on board such vessel has been affected with such disease) then in such case the vessel shall be detained such further time as the Board of Health may deem necessary, and the cargo and baggage, except such part thereof as in the opinion of the Board of Health may be supposed incapable of retaining infection, which said part may be transported to the city in lighters, shall, unless otherwise ordered and directed by the Board of Health, be unladened and thoroughly cleansed and purified, and the crew and passengers which were on board the said vessel, and the cargo and baggage on board the same, or any part thereof, except as before excepted, shall not be suffered to enter the city before the first day of October then next ensuing, without the license and permission of the Board of Health to that effect first had and obtained: *Provided nevertheless*, That such ship or vessel, after she shall have been thoroughly cleansed and purified, if no malignant disease appear on board, may be allowed to take in freight at the Lazaretto by means of lighters, and proceed to sea; and if any master or captain, or other person, on board of any vessel which shall be examined agreeably to this law, shall not true answers make to all such questions as the Lazaretto physician and quarantine master, or the said health officer or port physician shall ask, agreeably to this act or the rules heretofore established, or which shall from time to time be established by the Board of Health in conformity with this act, or shall knowingly deceive, or attempt to deceive, the proper officers as aforesaid in his

answers to their official inquiries, he having been duly informed and apprised of the penalties imposed by this act on the person so offending previous to his said examination, by the person making such examination, such person for each and every offence, being thereof legally convicted, shall forfeit and pay a sum not exceeding five hundred dollars, to be recovered and appropriated as hereinafter provided and directed, and moreover shall be sentenced to imprisonment at hard labour for any term not less than one year and not exceeding five years. And if any captain or master of any ship or vessel, shall neglect to present his certificate at the Health Office, in any case in which he is herein before directed so to do, within the time directed by this act, he shall forfeit and pay the sum of three hundred dollars to be recovered and appropriated as hereinafter directed. And if any captain or master of any ship or vessel, or any other person on board the same, shall refuse or neglect to comply with the directions of the Lazaretto physician or quarantine master, which shall be made agreeably to this act, or the regulations of the Board of Health, with respect to the detention of any ship or vessel, or the landing from on board the same, of any person or persons, or of any goods, merchandise, bedding, baggage or clothing, or shall refuse to carry the same into effect, such person for each and every such offence, shall forfeit and pay a sum not exceeding five hundred dollars, nor less than two hundred dollars, to be recovered and appropriated as is hereinafter provided and directed.

SECT. 5. *And be it further enacted by the authority aforesaid,* That any ship or vessel coming from any port or place within the United States, at which port or place the said ship or vessel had only called in or touched upon her arrival from a foreign port or place, shall be liable and subject to all the rules, regulations and restrictions of the preceding sections of this act, and shall be examined and treated as well the vessel itself as the cargo, crew, passengers and baggage, on board, in the same manner as if such ship or vessel had directly arrived at the Lazaretto from a foreign port or place without having first touched at a port or place within the United States; and all ships or vessels, as well vessels of war as merchant vessels, coming from any port or place within the United States, and bound to the port of Philadelphia, between the first day of June, and the first day of October in every year, and having on board any goods or merchandise, the growth or produce of any foreign place or country, or any person or persons' bedding or clothing, from any foreign port or place, shall come to anchor opposite the said Lazaretto, and shall be examined by the said Lazaretto physician and quarantine master, and if the captain or master of any such ship or vessel shall produce such satis-

factory proof as the Board of Health shall in that case direct to be required, that the said goods or merchandise shall have been landed in the United States, more than twenty days, and are free from damage, and that the said vessel, bedding, clothing and persons, are free from the infection of any dangerous contagious disease, (the small pox and measles excepted,) then and in that case the said physician and quarantine master shall give to the captain or master of such ship or vessel a certificate of the facts, permitting such ship or vessel to proceed to the city, which certificate the said captain or master shall present at the Health Office in Philadelphia, within twenty-four hours after his arrival, and safely mooring there; and if he should neglect so to do, being thereof legally convicted under this act, he shall be sentenced to pay a fine of two hundred dollars, to be recovered and appropriated, as is hereinafter directed and provided; and if the said captain or master shall fail to produce such satisfactory proof as aforesaid, of the wholesome state of the said vessel, goods, merchandise, bedding, clothing and persons, the said vessel, goods, merchandise, bedding, clothing and persons, shall be detained at the Lazaretto, and shall be proceeded with in the same manner, and subject to the same orders and regulations as are herein before provided and directed in the case of vessels coming directly from a foreign port or place; and if the captain or master of any such ship or vessel coming from any port or place within the United States, and bound to the port of Philadelphia, having on board any goods or merchandise, bedding, clothing or persons, as aforesaid, shall refuse or neglect to come to anchor opposite the Lazaretto, and shall pass the same with intent to proceed to the city without examination by, and certificate obtained from, the said physician and quarantine master as aforesaid, he shall, on conviction, forfeit and pay the sum of five hundred dollars, to be recovered and appropriated as is hereinafter provided and directed, and the said vessel, goods, merchandise, bedding, clothing and persons, shall be sent back to the Lazaretto, there to be proceeded with in such manner as the Board of Health, agreeably to this act, shall in that case devise and direct.

SECT. 6. *And be it further enacted by the authority aforesaid,* That every ship or vessel coming from the Mediterranean, shall be subject to a strict examination, under similar regulations and penalties, as are provided in the fourth section of this act, and if it appears that the said ship or vessel came from any place where the plague existed at the time of her departure, or has spoken with any vessel on board of which, any person was affected with the plague, or if any person is affected with the said disease on his arrival at the Lazaretto, or has been affected during the voyage, the said vessel shall not be suffered to pro-

ceed to the city, the cargo and baggage shall be unloaded and thoroughly cleansed and purified, and no part shall be suffered to enter the city without the permission of the Board of Health first obtained; and the crew and passengers shall perform a quarantine of not less than twenty days, nor more than forty, at the discretion of the Board of Health: *Provided nevertheless*, That such ship or vessel after she shall have been thoroughly cleansed and purified, may be allowed to take in freight at the Lazaretto by means of lighters and proceed to sea.

SECT. 7. *And be it further enacted by the authority aforesaid*, That any person or persons, and all goods, merchandise, bedding and clothing, arriving at any port or place, within the United States, from any foreign port or place at which any malignant or contagious disease, (the small pox and measles excepted,) prevailed at the time of their departure, or in any vessel in which any such disease existed while they were on board the same, are hereby prohibited from entering the city or county of Philadelphia, or the county of Delaware, (except the township of Tinicum,) at any time between the first day of June and the first day of October in any year, either by land or water, without permission of the Board of Health first had and obtained, under the penalty of five hundred dollars for each and every offence, and the forfeiture of all such goods, merchandise, bedding or clothing, to be recovered and appropriated as is hereinafter directed; and that all goods, wares, bedding, clothing and merchandise, seamen or passengers, landed from on board any ship or vessel belonging to the port of Philadelphia at any other port of the United States, shall be subject to perform twenty days quarantine, previously to entering the city or county of Philadelphia, under the same penalty as in the fifth section, without permission first obtained from the Board of Health.

SECT. 8. *And be it further enacted by the authority aforesaid*, That no person or persons, goods, wares, merchandise, bedding or clothing, from any port or place at which any malignant or contagious disease (the small pox or measles excepted) prevailed at the time of their departure, or from on board any vessel in which any such disease existed, while they were on board, shall enter or be brought into the city or county of Philadelphia at any time between the first day of June and the first day of October in any year, by land or water without the permission of the Board of Health first had and obtained, under the penalty of any sum not exceeding five hundred dollars for each and every such offence, and the forfeiture of all such goods, wares and merchandise, bedding, and clothing, to be recovered and appropriated, as directed by the twenty-ninth section of this act.

SECT. 9. *And be it further enacted by the authority aforesaid*,

That whenever the Board of Health shall receive information that any malignant or contagious disease (the small pox and measles excepted,) prevails in any port or place within the United States, or on the continent of America, they shall make diligent inquiry concerning the same, and if it shall appear that the disease prevails as aforesaid, all communication with such infected port or place, shall be subject to such controul and regulations as the Board of Health may from time to time think proper, to direct and publish in one or more newspapers published in the city of Philadelphia, and thereupon every person or persons, and all goods, wares and merchandises, bedding and clothing, from such infected port or place, and having entered and brought into the city and county of Philadelphia, contrary to such regulations shall be subject to the penalties and forfeitures provided by the next preceding section of this act; and all vessels from such port or place, and bound to the port of Philadelphia, shall stop at the Lazaretto, and be proceeded with in the same manner, and under the same penalties and forfeitures, as are provided in cases of vessels coming from foreign ports; and every person or persons having entered or been brought into the city or county of Philadelphia, from such infected port or place aforesaid, shall also be conveyed by any person authorized by the Board, to such place for purification, as the said Board may appoint or direct for that purpose, and be there detained at the pleasure of the Board any time not exceeding twenty days, and at the expense of such person or persons; and if the said Board shall have cause to suspect that any person or persons at the time, within the city and county of Philadelphia, have been at such infected port or place within fifteen days since such disease prevailed at such port or place next preceding, the said Board may lawfully require such person or persons to render satisfactory proof of their place or places of abode during the said period; and if such person or persons neglect or refuse to render such proof, or fail in proving their residence other than at such infected port or place, every such person shall be dealt with, by purification and detention, as persons coming from such infected port or place.

SECT. 10. *And be it further enacted by the authority aforesaid*, That no Lazaretto physician, quarantine master, or other officer, or servant of the said Lazaretto, shall absent himself from the place of his duty between the first day of June and the first day of October on any pretence whatsoever, for any time, without leave first obtained in writing from the Board of Health, under the hand of the president or chairman for the time, attested by the secretary and entered on the minutes, under the penalty of forfeiting his office and a fine of any sum not exceeding five hundred dollars.

SECT. 11. *And be it further enacted by the authority aforesaid*, That it shall be the duty of the Lazaretto physician, immediately on the arrival of any ship or vessel liable to be detained at the Lazaretto in order to be cleansed and purified as aforesaid, to cause the sick, if any on board, to be removed to the building which shall be appointed by the Board of Health for their reception, and diligently and impartially with his best skill to attend upon and administer medical assistance to each and every sick person that shall be therein lodged, and generally to superintend and cause to be executed such orders and regulations as the said Board shall from time to time ordain for the government and management of the Lazaretto, and of the vessels cargoes, and persons, under quarantine.

SECT. 12. *And be it further enacted by the authority aforesaid*, That it shall be the duty of the quarantine master, immediately after the arrival and examination as aforesaid, of any ship or vessel liable to be detained at the Lazaretto for purification as aforesaid, to direct and cause such ship or vessel to be properly moored near the Lazaretto at such distance from any vessel or vessels under quarantine as may prevent the communication of any infectious disease to or from the same. And the cargo, bedding, and clothing, or any part thereof contained in such ship or vessel to be landed, cleansed, and purified, under the direction of the Lazaretto physician; and it shall be the particular duty of the said quarantine master to prevent any personal intercourse between the persons on board different vessels under quarantine, and for that purpose to take possession of and secure the boats of such vessels from sunset to sunrise of the succeeding day, until their respective terms of quarantine shall be completed. To preserve and enforce order and obedience to this act, and all such orders and regulations as the Board of Health shall from time to time ordain for the government of the Lazaretto, and the persons, vessels, and cargoes, under quarantine.

SECT. 13. *And be it further enacted by the authority aforesaid*, That it shall be the duty of the port physician, upon receiving information from the Health Officer or other person whomsoever, that any person or persons on board of any ship or vessel in the port of Philadelphia is or are afflicted, or suspected to be afflicted, with any pestilential or contagious disease, or that there is just cause to suspect that the cargo or any part thereof, contained in any such ship, or vessel, is infected with any such disease, the said physician, in either of the foregoing cases, shall visit and carefully examine such ship or vessel, and if he shall discover any sick person or persons on board any such ship or vessel, he shall thereupon have and exercise the authority to direct such sick person or persons to be removed to the

said Lazaretto, or to some other safe place which may be specified by the Board of Health. And the said physician shall without delay report the state of said vessel, cargo, and crew, to the Board of Health, who shall direct and determine how the crew, passengers, vessel, and cargo, shall be disposed of and managed for the restoration of their health and purification. And on the arrival of any ship or vessel in the port of Philadelphia, from any foreign port or place, from the first day of October in any year to the first day of June in the next succeeding year, it shall be the duty of the said physician, provided such ship or vessel shall not have been previously visited and examined by the physician resident at the Lazaretto, and quarantine master, and before any of the passengers, crew, cargo, or baggage are landed, to visit and carefully examine such ship or vessel in manner and form as the said Lazaretto physician and quarantine master are bound to do, and to demand answers under oath or affirmation to be administered by the said port physician, who is hereby empowered to administer the same in conformity with this act. And if the crew, passengers, vessel, and cargo, be in a healthy state, and if there shall be no ground to suspect that any of the crew or passengers have died in the voyage of any dangerous contagious disease, (the small pox and measles excepted) or that the cargo, bedding, or clothing, is infected, then and in such case the said physician shall give to the master or commander a certificate of the facts, which the said master or commander shall present at the Health Office within twenty-four hours after such examination; and if he shall neglect so to do, being thereof legally convicted under this act, he shall be sentenced to pay a fine of two hundred dollars, to be recovered and appropriated as is herein provided and directed. And if on examination, any suspicion shall arise in the mind of the said physician touching the health of the crew or passengers, or the infectious state of the vessel, cargo, bedding, or clothing, on board, no part thereof shall be landed, but the said physician shall immediately report the same to the Board of Health, who shall direct and determine what measures shall be pursued relative thereto. And the said physician upon request of the Health Officer, or Board of Health, shall, from time to time, visit and examine such houses and persons as the said Board, or the Health Officer, shall have reason to suspect are infected with any dangerous contagious disease, and make report thereof to the said Health Officer. And every ship or vessel, so as aforesaid, arriving at the port of Philadelphia, shall be visited by the port physician previously to her being hauled to any wharf within the city or district aforesaid, or Wind Mill island; and every captain or other person so hauling such ship or vessel to any wharf as aforesaid, shall for each and every

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said Lazaretto, or to some other safe place which may be specified by the Board of Health. And the said physician shall without delay report the state of said vessel, cargo, and crew, to the Board of Health, who shall direct and determine how the crew, passengers, vessel, and cargo, shall be disposed of and managed for the restoration of their health and purification. And on the arrival of any ship or vessel in the port of Philadelphia, from any foreign port or place, from the first day of October in any year to the first day of June in the next succeeding year, it shall be the duty of the said physician, provided such ship or vessel shall not have been previously visited and examined by the physician resident at the Lazaretto, and quarantine master, and before any of the passengers, crew, cargo, or baggage are landed, to visit and carefully examine such ship or vessel in manner and form as the said Lazaretto physician and quarantine master are bound to do, and to demand answers under oath or affirmation to be administered by the said port physician, who is hereby empowered to administer the same in conformity with this act. And if the crew, passengers, vessel, and cargo, be in a healthy state, and if there shall be no ground ts suspect that any of the crew or passengers have died in the voyage of any dangerous contagious disease, (the small pox and measles excepted) or that the cargo, bedding, or clothing, is infected, then and in such case the said physician shall give to the master or commander a certificate of the facts, which the said master or commander shall present at the Health Office within twenty-four hours after such examination; and if he shall neglect so to do, being thereof legally convicted under this act, he shall be sentenced to pay a fine of two hundred dollars, to be recovered and appropriated as is herein provided and directed. And if on examination, any suspicion shall arise in the mind of the said physician touching the health of the crew or passengers, or the infectious state of the vessel, cargo, bedding, or clothing, on board, no part thereof shall be landed, but the said physician shall immediately report the same to the Board of Health, who shall direct and determine what measures shall be pursued relative thereto. And the said physician upon request of the Health Officer, or Board of Health, shall, from time to time, visit and examine such houses and persons as the said Board, or the Health Officer, shall have reason to suspect are infected with any dangerous contagious disease, and make report thereof to the said Health Officer. And every ship or vessel, so as aforesaid, arriving at the port of Philadelphia, shall be visited by the port physician previously to her being hauled to any wharf within the city or district aforesaid, or Wind Mill island; and every captain or other person so hauling such ship or vessel to any wharf as aforesaid, shall for each and every

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said Lazaretto, or to some other safe place which may be specified by the Board of Health. And the said physician shall without delay report the state of said vessel, cargo, and crew, to the Board of Health, who shall direct and determine how the crew, passengers, vessel, and cargo, shall be disposed of and managed for the restoration of their health and purification. And on the arrival of any ship or vessel in the port of Philadelphia, from any foreign port or place, from the first day of October in any year to the first day of June in the next succeeding year, it shall be the duty of the said physician, provided such ship or vessel shall not have been previously visited and examined by the physician resident at the Lazaretto, and quarantine master, and before any of the passengers, crew, cargo, or baggage are landed, to visit and carefully examine such ship or vessel in manner and form as the said Lazaretto physician and quarantine master are bound to do, and to demand answers under oath or affirmation to be administered by the said port physician, who is hereby empowered to administer the same in conformity with this act. And if the crew, passengers, vessel, and cargo, be in a healthy state, and if there shall be no ground to suspect that any of the crew or passengers have died in the voyage of any dangerous contagious disease, (the small pox and measles excepted) or that the cargo, bedding, or clothing, is infected; then and in such case the said physician shall give to the master or commander a certificate of the facts, which the said master or commander shall present at the Health Office within twenty-four hours after such examination; and if he shall neglect so to do, being thereof legally convicted under this act, he shall be sentenced to pay a fine of two hundred dollars, to be recovered and appropriated as is herein provided and directed. And if on examination, any suspicion shall arise in the mind of the said physician touching the health of the crew or passengers, or the infectious state of the vessel, cargo, bedding, or clothing, on board, no part thereof shall be landed, but the said physician shall immediately report the same to the Board of Health, who shall direct and determine what measures shall be pursued relative thereto. And the said physician upon request of the Health Officer, or Board of Health, shall, from time to time, visit and examine such houses and persons as the said Board, or the Health Officer, shall have reason to suspect are infected with any dangerous contagious disease, and make report thereof to the said Health Officer. And every ship or vessel, so as aforesaid, arriving at the port of Philadelphia, shall be visited by the port physician previously to her being hauled to any wharf within the city or district aforesaid, or Wind Mill island; and every captain or other person so hauling such ship or vessel to any wharf as aforesaid, shall for each and every

offence forfeit and pay the sum of two hundred dollars, to be sued for and recovered as herein provided, unless it shall be made appear by such captain or other person that there was at the time imminent danger of the loss of such ship or vessel, or of the passengers or crew thereof.

SECT. 14. *And be it further enacted by the authority aforesaid,* That it shall be the duty of the Health Officer at seasonable and proper hours on each day (Sundays excepted) to open and keep a public office at such convenient place in the city of Philadelphia as shall be directed by the Board of Health, whereat all masters or captains of ships or vessels shall deliver the certificates of bills of health to them granted by the Lazaretto physician and quarantine master, or port physician as aforesaid. And the Board of Health shall there assemble and meet, as often as they deem needful, for the purpose of executing the duties and trust of their appointment. And the said Health Officer shall file and preserve in good order all the certificates or bills of health so delivered, and shall keep a register of the ships or vessels, and the names of the captains or masters, owners or consignees, for which the same were respectively granted, the port or ports from which the ship or vessel respectively sailed, or at which they touched during their respective voyages, and the number of persons on board thereof respectively at the time of their leaving their respective ports of departure, and also at the time of their arrival respectively at the port of Philadelphia. And the said Health Officer shall attend the Health Office at the meeting of the Board of Health, and at such other times as shall be required for discharging the duties of his appointment, and generally enforce and execute the regulations and instructions of the Board of Health. And it shall be the duty of the said Health Officer to collect, recover, and receive all forfeitures and penalties imposed, and sums of money directed to be paid by this act. And the said Health Officer shall, before he enters on the duties of his office, give bond with sureties to the satisfaction of the Board of Health, conditioned for the faithful execution of the duties of his office, and to account for all monies which may come into his hands in pursuance thereof. And the said bond shall be a lien on the estates of the said Health Officer and his securities respectively.

SECT. 15. *And be it further enacted by the authority aforesaid,* That the letter mail shall during the quarantine season, leave the Lazaretto for the Health Office, in the city of Philadelphia, and return twice in each juridical day, at such hours as the Board of Health shall determine, and shall be free for the transmission of letters to and from persons who may be within the bounds of the Lazaretto, or on board of vessels which may be de-

tained there; and it shall be the duty of the Health Office immediately after the arrival of the Lazaretto mail, to deposit in the post office the letters received thereby, excepting those which shall be addressed to the Board of Health and the officers connected therewith.

SECT. 16. *And be it further enacted by the authority aforesaid*, That every diseased person duly landed or sent to the Lazaretto, by either of the aforesaid physicians, quarantine master, or Health Officer, shall be there kept and maintained until the Lazaretto physician shall grant him or her a discharge in writing, and if before obtaining a discharge as aforesaid, any such person shall elope or otherwise absent himself or herself from the Lazaretto, it shall be lawful for the Health Officer, or any constable or other person whom he shall call to his assistance, and they are hereby enjoined and required to lend such assistance, to pursue and apprehend the person so escaping or absenting himself or herself from the Lazaretto, and there again deliver him or her to be detained until he or she be duly discharged as aforesaid; and moreover the person so eloping and absenting himself or herself shall for each and every offence suffer such temporary confinement in the Lazaretto, not exceeding three months, as the Board of Health shall ordain and award; and if any master or captain shall knowingly receive or employ on board of his ship or vessel, or if any housekeeper or other inhabitant of this commonwealth shall knowingly receive, harbour, or in any way entertain any person so eloping or absenting from the Lazaretto, each and every master and captain, and each and every housekeeper or inhabitant so respectively offending shall, on being thereof legally convicted, forfeit and pay a sum of two hundred dollars; and if any person, arriving in or belonging to any ship or vessel detained at the Lazaretto as aforesaid, shall elope or absent himself or herself, without having first obtained a discharge, signed by the Lazaretto physician and quarantine master, or if any person other than those detained at the Lazaretto as aforesaid, shall go on board or along side of any ship or vessel whilst under quarantine as aforesaid, or if any person not authorized by the Board of Health shall go within the limits of the Lazaretto, such person or persons shall perform such quarantine as the Board of Health may direct, the person so offending, upon legal conviction of such offence, shall forfeit and pay the sum of two hundred dollars, to be recovered and appropriated as hereinafter directed; and if any diseased or other person landed and sent to the Lazaretto by any officer having authority to do the same, or any person so arriving in or belonging to any ship or vessel detained at the Lazaretto as aforesaid, shall refuse or neglect to obey the directions of the Lazaretto physician or quarantine master respec-

tively, agreeably to this act, and the order and regulations by the Board of Health, which shall from time to time be ordained and established for the government and management of the Lazaretto, and the persons, vessels, and cargoes under quarantine, the person so refusing or neglecting shall for each and every offence, on being thereof legally convicted, forfeit and pay the sum of two hundred dollars, to be recovered and appropriated as hereinafter directed; and the expense and charge of boarding, lodging, nursing, medicine, maintenance, and other necessaries, which shall have been provided for the diseased person landed and sent to the Lazaretto as aforesaid, and also of burying them in case of their death, shall be paid and discharged by the importer, master, or captain, owner, or consignee, of the ships or vessels respectively in which such diseased persons were respectively imported, agreeably to the rates in that behalf by the Board of Health to be ordained and established: *Provided always, nevertheless*, That when the diseased persons are passengers and not servants, the said expense and charges shall be repaid by them, their executors, or administrators, to the captain or master, owner, or consignee, who shall pay and satisfy, or be bound to pay and satisfy the same as aforesaid.

SECT. 17. *And be it further enacted by the authority aforesaid*, That when any vessel shall come up to the city of Philadelphia, or the shores of Southwark or the Northern Liberties, although the said vessel may have obtained a certificate of health from the Lazaretto physician and quarantine master, or the port physician, if the said vessel shall appear to the Board of Health to be infected with any contagious disorder, dangerous to the community, the said Board are hereby authorized to order the said vessel to the Lazaretto, there to undergo the necessary purification before she will be permitted to return to the city or the shores aforesaid. And the said Board are hereby authorized and empowered to remove any vessel or vessels from any part of the city or shore aforesaid as shall be infected with such disorders as aforesaid, to such convenient distance as they may deem proper, although such vessel may not be infected.

SECT. 18. *And be it further enacted by the authority aforesaid*, That whenever by means aforesaid, or by the report of the port physician or any other physician appointed by the Board of Health, (whom the said Board are hereby authorized to send to places or houses suspected to be infected) it shall come to the knowledge of the said Board, that any person within the city of Philadelphia, the district of Southwark, the townships of the Northern Liberties, Moyamensing, or Penn, is afflicted with any contagious disease, dangerous to the community, it shall and may be lawful for the said Board to take orders for preventing the spreading of the contagion, by forbidding and pre-

venting all communication with the infected house or family, except by means of physicians, nurses, or messengers, to convey the necessary advice, medicines, and provisions, to the afflicted; and shall exercise all such other powers as the circumstances of the case shall require, and as shall in their judgment be most conducive to the public good with the least private injury.

SECT. 19. *And be it further enacted by the authority aforesaid*, That no pilot bringing a ship or vessel to the Lazaretto in an apparent state of good health, shall be obliged to perform quarantine, but the Lazaretto physician shall grant such pilot a certificate permitting him to proceed to the Capes of Delaware, in order that he may prosecute his profession, but such pilot shall not on any pretence come into the city of Philadelphia, the Northern Liberties, the district of Southwark, or the township of Moyamensing, or Penn, for twenty days from the date of such certificate, under the penalty of one hundred dollars, or one year's imprisonment, which penalty shall be recovered and applied in the manner hereinafter directed. And any pilot bringing to the said Lazaretto a ship or vessel infected or supposed to be infected, with any pestilential or contagious disease, may be permitted to go and remain on shore within the bounds of the Lazaretto during the time the ship or vessel brought thither shall be detained under quarantine: *Provided always*, That if the said vessel shall be infected with any disease as aforesaid, he shall be detained and treated in the like manner as seamen or passengers so infected are herein directed to be detained and treated: *And provided further*, That if he shall go without the bounds of the Lazaretto, he shall be liable to the same penalties as are by this act imposed on seamen or passengers escaping therefrom.

SECT. 20. *And be it further enacted by the authority aforesaid*, That no member of the Board of Health shall be permitted to go within the limits of the Lazaretto during the continuance of the quarantine, and any one of them offending against this provision shall pay a fine of one hundred dollars, to be recovered by action in any court having competent jurisdiction, by the guardians of the poor for the city of Philadelphia, the district of Southwark, and the township of the Northern Liberties.

SECT. 21. *And be it further enacted by the authority aforesaid*, That no master or captain of any ship or vessel, bound to any port or place within this commonwealth, shall bring within the Capes of the bay and river Delaware, or in any port or place within this commonwealth, any greater number of passengers, servants, or other persons whatsoever, than can and shall be well supplied with sufficient good and wholesome drink and meat and other necessaries, particularly vinegar, as well to wash

and cleanse the vessel as for the use of the persons on board during the voyage. And every ship or vessel so arriving at any port or place within this commonwealth, shall be allowed to bring one passenger and no more for every two tons custom house measurement, and in such estimate two children between the ages of five and twelve years shall be taken and considered as equal to one full passenger. And before any such ship or vessel shall obtain a certificate from the Health Office, the master, or owner, or consignee, of such ship or vessel, shall pay to the Health Officer, for the use of the Board of Health, the sum of one dollar for each and every passenger not citizens of the United States, reckoning two children between the ages aforesaid as one passenger. And in case it should be made to appear satisfactorily to the Board of Health that such passengers are unable to pay the said sum of one dollar, then and in such case the Board of Health shall make out a list of such passengers, together with the names of the captain and vessel in which they were imported, and forward the same, under their official seal, to the governor, who shall draw his warrant on the state treasurer, in the usual manner, for the amount so specified. And every master or captain of any ship or vessel, importing passengers, servants, or other persons whatsoever, shall whenever the said passengers, servants, or other persons, amount to the number of one hundred, at the charge of the owner or owners of his ship or vessel, provide and employ a skilful physician of good character, and a chest with a competent assortment of medicines for the use and accommodation of all persons whatsoever on board his ship or vessel, and the physician so provided shall administer medicine and medicines to all sick persons on board the ship or vessel according to his best skill and judgment as often as occasion shall require, without asking, demanding, or receiving any pay or satisfaction therefor from such sick persons respectively. And the master or captain of any ship or vessel containing the number of passengers aforesaid, shall twice in every week, if the weather will permit, during the voyage, cause the ship or vessel to be well washed with vinegar, and while the means aforesaid shall be using to cleanse the ship or vessel, the master or captain thereof may require and compel all persons not incapacitated by sickness or other reasonable cause to come and remain on deck until such cleaning shall be performed and completed. And if any master, captain, or other person, whether severally or altogether shall, during the voyage, trust or credit any one passenger with more liquor or other articles whatsoever, than shall amount in the whole to the value of four dollars, or if more than one third part of that sum shall be for spirituous liquors, the master, captain, or other person so trusting or crediting, shall be disabled from recovering

any debts for all and any such articles from any passenger so trusted or credited. And the Lazaretto physician, port physician, and Health Officer respectively, on visiting any ship or vessel bound to any port or place within this commonwealth as aforesaid, shall diligently inquire whether the directions herein given have been fully complied with. And on the arrival of any vessel, importing German passengers, opposite to the city of Philadelphia, the Health Officer shall moreover visit the same and take with him a respectable German of the city of Philadelphia well versed in the English and German languages to be his interpreter, and the said interpreter shall be appointed and commissioned by the governor, and shall také an oath or affirmation before the mayor or any alderman of the city of Philadelphia for the time being, that he will well and faithfully interpret between the Health Officer and such German passengers, and in all other respects diligently and uprightly execute the duties of his appointment. And the Health Officer shall at least once in every week, taking with him the said interpreter, in case of a ship or vessel importing German passengers, go on board every ship or vessel having passengers to examine whether they are and have been accommodated agreeably to the directions of this act. And the said interpreter for the first visit shall have and receive the sum of two dollars, and for every subsequent visit the sum of one dollar, to be paid by the master, captain, owner, or consignee of the ship or vessel so visited. And if any master or captain of any ship or vessel shall not have provided a sufficient quantity of good and wholesome provisions, vinegar, and other necessaries as aforesaid, or if he shall not have provided a room or birth to the persons on board his ship or vessel, or if having the number of one hundred passengers as aforesaid, he shall not have provided a physician and chest of medicines for the use and accommodation of all persons on board his ship or vessel, or shall bring more than one passenger for every two tons, custom house measurement, or shall have neglected during the voyage to cleanse the ship or vessel in the manner herein before in such case directed, such master or captain shall for each and every of the foregoing offences forfeit and pay not less than two hundred dollars, nor more than fifteen hundred dollars, to be recovered and appropriated as hereinafter provided and directed.

SECT. 22. *And be it further enacted by the authority aforesaid*, That the buildings and lot of ground situate to the north west of Bush Hill, in the county of Philadelphia, shall be and continue a public hospital for the city of Philadelphia, the township of the Northern Liberties, and the districts of Southwark, Moyamensing, and Penn; and all persons, other than persons on board of any ship or vessel and liable to be sent as aforesaid

to the Lazaretto, residing within the city of Philadelphia, the district of Southwark, the townships of the Northern Liberties, Moyamensing, and Penn, who shall be afflicted with any pestilential or contagious disease (the small pox and measles excepted) may upon the advice and order of the port physician or any other physician or person authorized by the Board of Health to grant such order, be removed by the Health Officer, and such assistance as he shall for that purpose employ, to the said public hospital or to such other place as the physician or Board of Health shall approve, if the person afflicted with any contagious or pestilential disease cannot be properly and sufficiently attended at home, there be lodged, nursed, and maintained, and kept until duly discharged by a permit in writing signed by a physician of the said public hospital: *Provided always, nevertheless*, That each and every patient, and his and her estate, real and personal, shall be liable to pay, satisfy, and reimburse all the charges and expenses on his or her account incurred in the said public hospital, unless the Board of Health award that he or she shall be exonerated and exempted therefrom. And the Board of Health is hereby directed to lease out the said public hospital and lot of ground belonging to it, except when wanted for the sick, on the best terms that can be obtained.

SECT. 23. *And be it further enacted by the authority aforesaid*, That whenever the said Board of Health shall receive information that any contagious disease rages in any port or place within the United States, or on the continent of America, they shall make diligent inquiry concerning the same; and it shall and may be lawful for the said Board to prohibit and to prevent all communication by land and water with such infected ports or places, by stopping all vessels coming into the port of Philadelphia, and at and before the Lazaretto, in the same manner and under the same penalties and forfeitures as are hereby provided in cases of vessels coming from foreign ports, and by stopping all persons coming from said infected places, in such manner as the circumstances and exigencies of the case shall require. And the said Board of Health are hereby authorized and required, whenever a fever of a contagious nature shall appear in any part of the city of Philadelphia, the district of Southwark, or the townships of the Northern Liberties, Moyamensing, or Penn, to adopt without delay such prompt measures as will effectually prevent all communication between the part or parts so infected, and any other part of the city, district, or townships; and all judges, justices, sheriffs, constables, and other civil officers and citizens of this state, are hereby authorized and empowered, enjoined and required, to aid and assist the said Board and their officers to the utmost of their power in

carrying into effect such rules, orders, and regulations, touching the stoppage of such intercourse, or the removal of the infected, when they cannot properly be attended to at home, as the Board shall order and publish.

SECT. 24. *And be it further enacted by the authority aforesaid*, That every person keeping a boarding or lodging house, in the city of Philadelphia, the district of Southwark, or the townships of the Northern Liberties, Moyamensing, or Penn, between the first day of June and the fifteenth day of October in any year, shall within twelve hours after any seafaring man or sojourner shall become sick in such boarding or lodging house, report in writing the name of such diseased person to the Health Officer, and no master of a vessel or other person from any vessel whatsoever, shall remove any sick person lying in the river Delaware, before the city of Philadelphia, the district of Southwark or the township of the Northern Liberties, before such sick person has been visited by the port physician, and a written permit granted by him for the purpose of such removal. And any person neglecting or refusing to comply with the provisions of this section shall on legal conviction thereof, be subject to a fine not exceeding fifty dollars or to imprisonment for any term not exceeding three months; and no person shall hereafter be subject to be punished by imprisonment by virtue of this act without a previous conviction in due course of law: *Provided*, That nothing herein contained shall be construed to prevent the Board of Health from temporarily confining any person within the Lazaretto bounds, for such time as the said Board may deem necessary for the safety of the public.

SECT. 25. *And be it further enacted by the authority aforesaid*, That every person practising physic in the city, districts and townships aforesaid, who shall have a patient labouring under a pestilential or contagious disease (small pox and measles excepted) shall forthwith make a report in writing to the Health Officer, and for neglecting so to do he shall be considered guilty of a misdemeanor, and subject to a fine not exceeding fifty dollars.

SECT. 26. *And be it further enacted by the authority aforesaid*, That whenever any person shall die in the city, district, or townships aforesaid, the physician or surgeon who shall have attended such person, as a physician or surgeon during his or her last sickness, shall leave a note in writing signed with his name with some one of the family in the house where such person shall have died, specifying the name and apparent age of the deceased and the disease of which he or she shall have died. And every physician or surgeon refusing or neglecting to make and deliver such note, shall forfeit the sum of five dollars. And

that no sexton of any church, or other person having charge of any cemetry, vaults, or burial grounds, in the city, district, or townships aforesaid, shall permit any dead body to be interred therein until he has received such note in writing so signed as aforesaid, or in case no physician or surgeon shall have attended such deceased person, or the physician or surgeon who did attend shall have neglected or refused to leave such a note, then a like note signed by some of the family in which such person shall have died. The contents of which note in writing shall be entered by such sexton on a blank schedule to be furnished by the clerk of the Health Office, or such other person as the Board of Health direct, and delivered together with the said schedule, on the Saturday of every week to the Health Office for publication, in such form as may be designated by the Board of Health. And that every sexton or other person, having charge of any place of interment neglecting or refusing to perform any of the duties required by this act shall forfeit the sum of twenty-five dollars.

SECT. 27. *And be it further enacted by the authority aforesaid*, That the Board of Health or a committee of them shall have power, having first obtained a warrant from a justice of the peace in due form of law founded on a complaint of two householders under oath or affirmation, directed to the sheriff of the county of Philadelphia, or his deputy, to enter and search all houses, stores, cellars, and other inclosures, between sunrise and sunset where they may have just cause to suspect any nuisance to exist: *Provided however*, That no sheriff or deputy sheriff shall execute any civil process either by arresting the body or attaching the goods and chattels of any person or persons under colour of any entry made for the purposes aforesaid, unless such service could by law have been made without such entry, and all services so made under colour of such entry shall be utterly void, and the officer making such service shall be considered a trespasser. And it shall be the duty of the said Board to cause all offensive or putrid substances, and all nuisances which may have a tendency in their opinion to endanger the health of the citizens, to be removed from the streets, lanes, alleys, highways, wharves, docks, or any other part or parts of the city of Philadelphia, the district of Southwark, and the townships of the Northern Liberties, Moyamensing, and Penn, and to cause such of the privies within the limits aforesaid, to be emptied or corrected with lime or otherwise at the expense of the individuals who are the owners of the houses to which the said privies are appurtenant, as the said Board shall from time to time deem necessary for the health of the inhabitants thereof. And if the owners or occupiers of the premises on which any nuisance may be found, and the owners of

the houses to which the said privies are appurtenant, shall, on due notice thereof, refuse or neglect to have the same immediately removed, emptied, or corrected as aforesaid, he, she, or they, so refusing or neglecting, shall forfeit and pay for every such offence any sum not less than twenty, nor more than two hundred dollars to be recovered and appropriated as by this act directed. And the expense attending the removal of such nuisance shall be recovered by the Board in any court having lawful jurisdiction from all corporate bodies and individuals in case due notice has been given to remove the same and a refusal or neglect to do so within the time prescribed by the Board.

SECT. 28. *And be it further enacted by the authority aforesaid,* That if any person shall wilfully and knowingly obstruct or resist the Board of Health, or any of the members thereof, or any persons by them appointed in the execution of the powers to them given, or in performance of duties enjoined on them by this act, and the rules and regulations of the said Board, such person shall on being thereof legally convicted, forfeit and pay a sum not exceeding five hundred dollars, to be recovered and appropriated as is hereinafter directed. And if after the expiration of the quarantine, any mariner or other person who shall have complied with the regulations hereby established, shall commit any violence on the person of a member of the Board of Health, or any of the officers attached to the same, for any thing done in the execution of his duty, such person shall be subject on conviction thereof to a fine of two hundred dollars, and shall also be sentenced to imprisonment at hard labour for any term not exceeding three years.

SECT. 29. *And be it further enacted by the authority aforesaid,* That for payment and satisfaction of all forfeitures and penalties, which are imposed by this act, and all sums of money directed by this act to be paid, it shall be the duty of the Health Officer to sue and prosecute, and the same to collect, recover and receive, and the same shall be recoverable before any alderman, justice of the peace, or court of justice, having lawful jurisdiction to the amount of such forfeitures, penalties, and sums of money respectively, or in the case, or upon the offence upon which the proceeding shall be had, and the same when recovered and received, shall be appropriated, and shall inure to the use of the institution, under the management and direction of the Board of Health, and no citizen or inhabitant of the city of Philadelphia, the district of Southwark, or the township of the Northern Liberties, or Moyamensing, or Penn, shall be disqualified from sitting as judges or jurors, or from giving testimony respecting any of the offences mentioned in this act, by reason of his, her or their common interest in the appropriation of the sum or penalties imposed for such offence, nor shall

any member of the Board of Health, or any officer intrusted with the execution of this act, or any part thereof, be disqualified from giving testimony respecting any of the said offences. And the said members of the Board of Health, shall, during their continuance in office, be exempted from the duties of jurors, and from militia duty.

SECT. 30. *And be it further enacted by the authority aforesaid*, That the Lazaretto physician, quarantine master, port physician, and health officer, shall, from and after the passing of this act, receive annually, the following salaries, as a compensation for their services, that is to say: The Lazaretto physician, the sum of twelve hundred dollars; the quarantine master, the sum of seven hundred dollars; the port physician, the sum of five hundred dollars; and the health officer, the sum of six hundred dollars, to be paid quarterly, by an order drawn by the Board of Health on their treasurer. And the quarantine master shall accompany the Lazaretto physician, on the arrival of vessels at the Lazaretto, and shall have them moored, and when necessary, well cleansed and white washed, for which he shall be paid in addition to his salary, by the master, owner or consignee, and shall be allowed to charge for lime and brushes, the usual prices at which such articles are retailed in the city of Philadelphia, (he shall also be authorized to receive all letters and papers to be forwarded to Philadelphia by the Lazaretto mail, and by any other conveyance he may think proper,) and no person shall be permitted to go on board any vessel under quarantine, except the Lazaretto physician and quarantine master, unless at the request of either of them to perform some necessary service. And the quarantine master shall be furnished with such boats and crews as the Board of Health may judge necessary, for having the duties of the Lazaretto physician and quarantine master, carried into complete effect, and shall be also furnished with a good spy-glass.

SECT. 31. *And be it further enacted by the authority aforesaid*, That all actions or prosecutions to be commenced against any master, captain, owner or consignee of any ship or vessel, or other person, by virtue of this act, shall be brought within twelve months next, after the commission of the offence, wherewith he is charged, and if any action or suit shall be commenced against any person or persons, for any matter or thing committed in violation of this act, the defendant or defendants may plead the general issue, and give this act and the special matter in evidence, in any trial to be had thereupon. And for the payment and satisfaction of all forfeitures and penalties which are imposed, and all sums of money directed by this act to be paid by the masters, captains, owners or consignees, as well the ships or vessels respectively, as the captains, masters,

owners or consignees thereof, shall be and are hereby declared liable.

SECT. 32. *And be it further enacted by the authority aforesaid*, That for defraying the expenses to be incurred in erecting and supporting the said Lazaretto, and for carrying into complete effect the other provisions contained in this act, the said Board of Health are hereby authorized and empowered by, and with the consent of the mayor or recorder, two aldermen and two justices, as aforesaid, to levy and collect by tax on the estates and inhabitants of the city of Philadelphia, the district of Southwark, and the townships of the Northern Liberties, Moyamensing and Penn, in the same manner, at the same rates, and under the same regulations as the county rates and levies are, or may be by law, levied and collected, such sums annually as the said Board by, and with the consent of the mayor or recorder, two aldermen, and two justices as aforesaid, shall deem necessary, for the use of the said institution, provided the same shall not exceed fifteen thousand dollars. And to defray the expenses necessarily incurred during a season, when malignant fever shall become general, or be the cause of extraordinary expense, it shall, and may be lawful for the said Board of Health to borrow such sum or sums of money, as shall be deemed necessary, and for discharging the debt so incurred, the said Board shall be, and hereby are authorized and empowered, to increase the amount of taxes in the manner aforesaid, to such sum as may be requisite for that purpose.

SECT. 33. *And be it further enacted by the authority aforesaid*, That it shall be the duty of the said Board of Health, and they are hereby authorized to invest all sums of money, which may at any time be in the hands of their treasurer, over and above the amount which may be necessary to meet their current expenses in the funded debt of the United States, the stock of the bank of the United States, or in the stock of any other incorporated bank in the city of Philadelphia, and to sell and transfer the same at such times, and in such portions as necessity may require.

SECT. 34. *And be it further enacted by the authority aforesaid*, That the said Board of Health, shall on the first Monday in January, in every year, exhibit their accounts to the auditors of the county of Philadelphia, and it shall be the duty of the said auditors to settle and adjust the account of all monies received and expended by the said Board of Health, and the said auditors shall have power and authority in settling such accounts, as they have in other cases, and on filing a copy of such settlement in the prothonotary's office, it shall be under the same laws, rules and regulations, and shall have the same operation and effect upon every of the members of the said Board of

Health, and in all other respects as the report of auditors against county treasurers.

SECT. 35. *And be it further enacted by the authority aforesaid,* That the act entitled, "An act for establishing an Health Of- "fice, for otherwise securing the city and port of Philadelphia "from the introduction of pestilential and contagious diseases, "and for regulating the importation of German and other pas- "sengers," passed the twenty-second day of April, seventeen hundred and ninety-four, be and the same is hereby repealed, except the 21st and 22d sections of the said act. And the act entitled, "A supplement to the act entitled, 'An act for esta- "blishing an Health Office, for otherwise securing the city and "port of Philadelphia, from the introduction of pestilential and "contagious diseases, and for regulating the importation of "German and other passengers," passed the twenty-third day of September, seventeen hundred and ninety-four; and the act entitled, "An act supplementary to the several acts establishing "an Health Office," passed the seventeenth day of April, se- venteen hundred and ninety-five. And the act entitled, "A "further supplement to the act entitled, 'An act for establish- "ing an Health Office, for otherwise securing the city and port "of Philadelphia from the introduction of pestilential and con- "tagious diseases, and for regulating the importation of Ger- "man and other passengers," passed the seventeenth day of April, seventeen hundred and ninety-five. And the act enti- tled, "An act to amend and repeal certain provisions in the "Health Laws of this commonwealth," passed the fourth day of April, one thousand seven hundred and ninety-six. And the act entitled, "An act to alter and amend the Health Laws "of this commonwealth, and to incorporate a board of mana- "gers of the marine and city hospitals of the port of Philadel- "phia, and for other purposes therein mentioned," passed the fourth day of April, seventeen hundred and ninety-eight. And the act entitled, "An act for establishing an Health Office, for "securing the city and port of Philadelphia from the introduc- "tion of pestilential and contagious diseases," passed the eleventh day of April, seventeen hundred and ninety-nine. And the act entitled, "An act for establishing a Health Office, and "to secure the city and port of Philadelphia from the introduc- "tion of pestilential and contagious diseases," passed the se- venteenth day of March, eighteen hundred and six. And the act entitled, "An act to continue in force an act entitled, "An "act for establishing a Health Office, and to secure the city and "port of Philadelphia from the introduction of pestilential and "contagious diseases and supplementary thereto," passed the thirty-first day of March, eighteen hundred and twelve. And the act entitled, "An act to amend and continue 'An act for

"establishing a Health Office, and to secure the city and port "of Philadelphia from the introduction of pestilential and con- "tagious diseases, and the supplement thereto," passed the twenty-fifth day of March, eighteen hundred and thirteen. And the act entitled, "An act to amend and continue "An act for "establishing a Health Office, and to secure the city and port "of Philadelphia from the introduction of pestilential and con- "tagious diseases," and the supplement thereto, passed the thirteenth day of March, eighteen hundred and seventeen, be and the same are hereby repealed: *Provided nevertheless*, That all actions, prosecutions or other proceedings begun, all rights accruing, and all penalties incurred under the said acts, shall be carried on, prosecuted, vested in, sued for, and recovered, by the Board of Health, established by this act in all respects as if the said acts had not been repealed and appropriated, as is directed by this act.

WILLIAM DAVIDSON,
Speaker of the House of Representatives.
ISAAC WEAVER,
Speaker of the Senate.

Approved, the twenty-ninth day of January, one thousand eight hundred and eighteen.

WILLIAM FINDLAY.

A SUPPLEMENT

To an Act, entitled "An act for establishing a Health Office, and to secure the City and Port of Philadelphia from the introduction of pestilential and contagious diseases, and for other purposes."

Sect. 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, and it is hereby enacted by the authority of the same,* That from and after the passing of this act, between the first day of June and the first day of October, every ship or vessel coming from any port or place southward of Cape Fear, bound to Philadelphia, shall be subject to the examination directed by the fourth section of the act to which this is a supplement, for every ship or vessel coming from any foreign port or place, and the master, commander or pilot of every such ship or vessel coming from any port or place southward of Cape Fear, shall be subject to the same restrictions, and liable to the same indictment, prosecution and penalties, as by the said fourth section

of the said act is prescribed for the master, commander or pilot of any ship or vessel coming from any foreign port or place. And the same duties shall be performed by the Lazaretto physician and quarantine master, and the same oaths or affirmations shall be by them administered, first making known to the person interrogated the penalty imposed by the said act to which this is a supplement, which penalty is hereby extended to every person who shall give false answers, under oath or affirmation, to the questions proposed under the authority of this act. And the said physician and quarantine master, and the master or captain of such ship or vessel, shall proceed in the same manner in all respects as is directed by the said fourth section of the act to which this is a supplement; and the Board of Health shall have the same power to determine and direct what measures shall be pursued, and the same shall be carried in like manner into execution.

SECT. 2. *And be it further enacted by the authority aforesaid*, That from and after the passing of this act, between the first day of June and the first day of October, every ship or vessel coming from a port or place in the United States, bound to the port of Philadelphia, and from which ship or vessel shall have been, within thirty days then next preceding, unladen, the whole or a part of the cargo or baggage, brought in the said ship or vessel from some foreign port or place, every such ship or vessel shall be liable and subject to all the rules regulations and restrictions of the said fourth section of the said act to which this is a supplement, and shall be examined and treated as well the vessel itself, as the cargo, crew, passengers and baggage on board, in the same manner as if such ship or vessel had brought the same cargo, crew, passengers or baggage, directly from such foreign port or place, and had the same then on board at the Lazaretto.

SECT. 3. *And be it further enacted by the authority aforesaid*, That from and after the passing of this act, between the first day of June and the first day of October, no ship or vessel which shall be laden with, or have on board, any vegetables, fish or hides, shall be unladen at the port of Philadelphia, until a permit shall be applied for and obtained from the Board of Health. And if any master, captain, or owners, consignee or consignees, or other persons, shall presume to unlade from on board of any such ship or vessel, any vegetables, fish or hides, without first having applied for and obtained a permit from the Board of Health, every such master, captain, owner or owners, consignee or consignees, or other person, so offending, shall pay a fine not exceeding five hundred dollars, to be recovered and appropriated as is directed in the act to which this is a supplement.

SECT. 4. *And be it further enacted by the authority aforesaid*,

That from and after the passing of this act, between the first day of June and the first day of October, within forty-eight hours after the discharge of the cargo of every ship or vessel at the port of Philadelphia, it shall be the duty of the captain or master, owner or owners, consignee or consignees, and other person, having the direction of the discharge of the same, under the penalty of one hundred dollars, to be recovered and appropriated as by the act to which this is a supplement is directed, to give, or cause to be given, to the Board of Health, notice that the same cargo is discharged, and to permit and suffer the Board of Health, by themselves or by their lawful agent by them for that purpose, appointed, to examine the condition of the hold, ballast and limbers of such ship or vessel. And if the Board of Health shall deem it for the safety and health of the city of Philadelphia, they are hereby authorized and empowered to designate a proper place to which the said ship or vessel shall be taken, and that her hold, ballast and limbers shall there be cleansed and purified, or at the expense of such captain or master, owner or owners, consignee or consignees, or other person, having the direction of the discharge of the cargo, to send, or cause to be sent, such ship or vessel to a proper place, and have her hold, ballast and limbers cleansed and purified.

SECT. 5. *And be it further enacted by the authority aforesaid*, That from and after the passing of this act, between the first day of June and the first day of October, no person or persons shall, under the penalty of fifty dollars, to be recovered and appropriated as is directed by the act to which this is a supplement, be permitted to store, or keep in any one house, store, cellar or other inclosure, a greater quantity than one hundred bushels of vegetables which are in themselves of a perishable nature, without a permit from the Board of Health, which permit shall be granted for a limited time therein expressed, and may be renewed from time to time by the Board of Health.

JOHN GILMORE,
Speaker of the House of Representatives.

PHILIP S. MARKLEY,
Speaker of the Senate.

APPROVED, April 2d, 1821.

JOSEPH HEISTER.

EXTRACT

FROM THE

ACT FOR THE REGULATION

OF

PILOTS AND PILOTAGE,

IN THE

BAY AND RIVER DELAWARE.

Passed March 29, 1803;

AND THE SUPPLEMENT THERETO,

Passed March 13, 1817.

SECTION 17. *And be it further enacted by the authority aforesaid*, That every person exercising the profession of a pilot in the bay or river Delaware, shall within three months after the passing of this act, apply in person to the board of wardens for the port of Philadelphia, for a license to entitle him to follow that occupation, and that it shall be the duty of at least three of the said wardens, to examine every person so applying, as to his fitness in all respects to perform the duties of a pilot, and to grant license to all such as they shall deem qualified according to their respective abilities; those of the first class to persons capable of piloting ships or vessels of any practicable draught of water, those of the second class to persons capable of piloting ships or vessels drawing twelve feet water or under, those of the third class to persons capable of piloting ships or vessels drawing nine feet or under; which licenses shall be in force for one year from the date thereof, and until the pilots respectively shall next after expiration of the year, arrive with any ship or vessel at the port of Philadelphia, and no longer; but every pilot delivering up his license shall be entitled to receive a new one in lieu thereof, giving like security as hereinafter directed, unless it shall appear to the said wardens that the person applying is disqualified from exercising the duties of a pilot; and if any person shall after the time herein prescribed for taking out licenses, exercise the profession of a pilot in the bay or river Delaware without such license, or at any time after

his license shall have expired, he shall forfeit for every vessel which he shall undertake to pilot to or from the port of Philadelphia, the sum of thirty dollars, together with the pilotage to which he would be otherwise entitled, one half to the use of the persons who shall sue for the same, and the other half for the use of decayed pilots, their widows and children.

SECT. 18. *And be it further enacted by the authority aforesaid*, That no license of the first class shall be granted to any person who at the time of passing this act, shall not be, or within three months previous thereto, have been, a licensed pilot by virtue of the laws of this commonwealth, or who shall not have served a regular appenticeship of at least six years to a licensed pilot; nor any license of the second class except to persons already licensed as aforesaid, or such as shall have served an apprenticeship of at least five years in manner aforesaid, nor any license of the third class except to persons already licensed as aforesaid, or who shall have served an apprenticeship of at least four years in manner aforesaid, and all indentures of apprentices to pilots shall be recorded in the warden's office, for which the master of such apprentices shall pay the sum of twenty-five cents, to be applied towards defraying the contingent expenses of the said warden's office; nor shall any license be granted until the person applying shall have given bond, with one sufficient surety to the governor of the commonwealth, in any sum not exceeding five hundred dollars, nor less than three hundred dollars, conditioned for the true and faithful performance of the duties and services required by this act, and that they will not be aiding or assisting in defrauding the revenue of the United States, and that they will deliver up the license to them granted when required by the wardens, in pursuance of the provisions of this act; *Provided*, That no person shall be entitled to a license as pilot for any branch, without first having under the immediate inspection of his master, or a pilot of the first branch, conducted a square rigged vessel (at least brig rigged) twice up and twice down the river.

SECT. 19. *And be it further enacted by the authority aforesaid*, That if any person having license as a pilot, shall for the space of two weeks refuse or wilfully neglect to execute the duties of a pilot, every such pilot upon due proof thereof shall forfeit his license: and if any pilot shall enter into any combination, with a view of preventing any other person from executing such duties, every such pilot being thereof duly convicted, shall forfeit his license as a pilot for the bay or river Delaware; and if it should so happen that the number of pilots necessary for the port of Philadelphia, should be reduced by decease, removal or otherwise, as to occasion much inconvenience to the trade of the state, in such case the wardens of the said port, or

any three or more of them, are here empowered, on such particular occasion as aforesaid, to grant certificates to such person or persons as they may find qualified to act as pilots, for the said space of six months, subject to be renewed if occasion should require it, and subject to the like rules, orders and regulations, and liable to the like fines, penalties and forfeitures, as other pilots who shall be appointed by virtue of this act.

SECT. 20. *And be it further enacted by the authority aforesaid*, That the licenses or certificates heretofore granted to any pilot or pilots, by any former board of wardens and not vacated, shall be of the same force and effect, as if the said licenses or certificates were granted in pursuance of the directions of this act, and all securities given by any pilots and others on their behalf, shall be and continue to all intents and purposes of the same force and effect, as any securities to be taken in pursuance of this act may or can be.

SECT. 21. *And be it further enacted by the authority aforesaid*, That the pilot who shall first offer himself to any inward bound ship or vessel, shall be entitled to take charge thereof: *Provided*, His license shall authorize him to pilot ships or vessels of such draught of water, and it shall be the duty of such pilot if required, to exhibit his license to the master or commander of such ship or vessel; and in case the draught of water of such ship or vessel shall be greater than such pilot shall be licensed to carry, he may nevertheless with the consent of the master, take charge of such ship or vessel until a pilot duly qualified shall offer, and if such qualified pilot shall offer before such ship or vessel shall have passed Reedy Island, he shall be received, and the former pilot entitled to pilotage according to the distance he may have conducted such ship or vessel, and the latter to the residue of the pilotage, which shall be ascertained by the master warden for the time being; and the master or commander of such ship or vessel, shall display the signal for a pilot heretofore used, until a pilot duly qualified shall offer, and if the said master or commander shall refuse or neglect so to do, or shall refuse or neglect to receive a pilot duly qualified, the master, owner or consignee of such ship or vessel, shall forfeit and pay to the wardens aforesaid, a sum equal to the half pilotage of such ship or vessel, to the use of the society, for the relief of distressed and decayed pilots, their widows and children, to be recovered as pilotage in the manner hereinafter directed; and in all cases when extraordinary services have been rendered by any pilot or pilots, the board of wardens shall, in case the parties cannot agree, determine the compensation to be allowed for such services; and the pilot shall inform the master of every vessel he shall conduct to the port of Philadelphia, of the rules and regulations necessary in reporting at the warden's office.

SECT. 22. *And be it further enacted by the authority aforesaid,* That it shall be the duty of every master or commander of a ship or vessel, outward bound from the port of Philadelphia, and he is hereby required to remain twenty-four hours after his arrival at the capes, to give to the pilot on board such ship or vessel an opportunity to be taken out; and if the master or commander of such ship or vessel refuse so to do, and if the same can be done without endangering the vessel aforesaid, the master, owner or consignee of such ship or vessel, shall forfeit and pay to such pilot, his executors or administrators, any sum not exceeding eight hundred dollars, to be recovered in any court of record in which the same may be sued for, by action of debt or otherwise.

SECT. 23. *And be it further enacted by the authority aforesaid,* That if it shall so happen that any first rate pilot, having a boat attending him, shall be carried to sea in any ship or vessel contrary to his inclination, by stress of weather or other unavoidable accident, the master, owner or consignee of such ship or vessel, shall pay to such pilot, his executors or administrators, the same wages as the master of said vessel receives, until the return of said pilot to the said capes, or in case he shall die while so absent, then to the time of his death; and if any second rate pilot shall be carried off as aforesaid, the same wages as the first mate of such vessel receives; and if any third rate pilot shall be carried off as aforesaid, the same wages as the seamen of such vessel receive; and if any pilot as aforesaid, not having a boat attending him, shall be carried to sea as aforesaid, he shall be paid one half the wages he would have been entitled to, had a boat been attending.

SECT. 24. *And be it further enacted by the authority aforesaid,* That when any inward bound ship or vessel having a pilot on board, shall be prevented by the ice or any other cause, from proceeding to the port of Philadelphia, and shall be compelled to proceed to some other port or place not in the bay and river Delaware, the pilot shall be entitled to receive and recover from the owner or owners of such ship or vessel, full pilotage as if he had conducted such ship or vessel to the port of Philadelphia, and shall also receive the sum of eight cents for each and every mile he shall travel to his usual place of abode.

SECT. 25. *And be it further enacted by the authority aforesaid,* That there shall be allowed two dollars per day, to every pilot of any ship or vessel compelled to perform quarantine, for every day he may be detained, to be paid by the master, owner or consignee of such ship or vessel, and the pilot of such ship or vessel shall not be discharged in less than six days without his consent.

SECT. 26. *And be it further enacted by the authority aforesaid,*

That from and after the passing of this act, there shall be paid by every pilot obtaining a license or branch, to authorize him to act as a pilot for the bay and river Delaware, the sum of fifty cents, to be applied for the support of the warden's office.

SECT. 27. *And be it further enacted by the authority aforesaid,* That the compensation to pilots for conducting ships or vessels from the city of Philadelphia to the capes of Delaware, or from the capes of Delaware to the city of Philadelphia, shall be for every half foot of water which any inward bound vessel shall draw under and up to twelve feet, the sum of one dollar and thirty-three cents; and for every half foot of water which such vessel shall draw more than twelve feet, the sum of one dollar and sixty-seven cents; and for every half foot of water which any outward bound vessel shall draw under and up to twelve feet, the sum of one dollar; and for every half foot of water which such vessel shall draw more than twelve feet, the sum of one dollar and thirty-three cents; to be paid by the owner or consignee of such ship or vessel; and shall also receive over and above the said sums, for every vessel not being registered within the United States, the sum of two dollars and sixty-seven cents; and shall also receive over and above the said sums for conducting all ships or vessels, to or from the city of Philadelphia for ever, between the twentieth day of November and the tenth day of March inclusive, in any year, the additional sum of ten dollars: *Provided,* That no pilot shall have or receive any reward for any supernumerary inches under six, and if any pilot shall be detained by any master, owner or consignee of any vessel, or by the ice, he shall be entitled to receive from the master, owner or consignee of such ship or vessel, the sum of two dollars for every day he shall be so detained.

SECT. 28. *And be it further enacted by the authority aforesaid,* That the compensation to be paid to pilots for conducting to or from the city of Philadelphia, all dismasted or otherwise crippled vessel or vessels, which shall have been in any wise injured, so as to occasion to the said pilots any extraordinary care or trouble, shall not exceed double the amount what they otherwise would have been entitled to, of which the board of wardens shall judge.

SECT. 29. *And be it further enacted by the authority aforesaid,* That every ship or vessel arriving from or bound to any foreign port or place, and every ship or vessel of the burthen of seventy-five tons or more, sailing from or bound to any port* not within the river Delaware, shall be obliged to receive a pilot; and it shall be the duty of the master of every such ship or vessel, within thirty-six hours next after the arrival of such ship or

* *Part* in the original.

vessel at the city of Philadelphia, to make report to the master warden of the name of such ship or vessel, her draught of water, and the name of the pilot who shall have conducted her to the port, and where any such vessel shall be outward bound, the master of such vessel shall make known to the wardens the name of such vessel, and of the pilot who is to conduct her to the Capes, and her draught of water at that time; and it shall be the duty of the wardens to enter every such vessel in a book, to be by them kept for that purpose, without fee or reward; and if the master of any ship or vessel shall neglect to make such report, he shall forfeit and pay the sum of sixty dollars, and if the master of any such ship or vessel shall refuse or neglect to take a pilot, the master, owner or consignee of such vessel, shall forfeit and pay to the wardens aforesaid, a sum equal to the half pilotage of such ship or vessel, to the use of the society for the relief of distressed and decayed pilots, their widows and children, to be recovered as pilotage in the manner herein after directed: *Provided always*, That where it shall appear to the wardens, that in case of an inward bound vessel, a pilot did not offer before she had reached Reedy Island, or in case of an outward bound vessel, that a pilot could not be obtained for twenty-four hours after such vessel was ready to depart, the penalty aforesaid for not having a pilot shall not be incurred.

SECT. 30. *And be it further enacted by the authority aforesaid*, That when any inward bound ship or vessel having a pilot on board, shall be detained by ice and conducted by him to a place of safety, it shall and may be lawful for the master of any such ship or vessel, after being so detained for forty-eight hours to discharge his pilot, and in such case the pilot shall be entitled to receive and recover full pilotage, as if he had conducted such ship or vessel to the port of Philadelphia, and in case such pilot shall be detained more than forty-eight hours, his compensation for such detention shall be two dollars per day, for every day he shall be so detained.

SECT. 31. *And be it further enacted by the authority aforesaid*, That if any pilot shall misbehave in the execution of his duty, so that damage shall accrue by reason of his negligence or incapacity, it shall and may be lawful for the person or persons injured or aggrieved, to complain to the wardens, who shall thereupon appoint a time and place of hearing, of which due notice shall be given to such pilot, and upon due proof thereof being made to the wardens, it shall be lawful for them to fine such pilot in any sum not exceeding the amount of the pilotage of the ship or vessel, to which such damage shall have happened, for the use of decayed pilots, their widows and children, or to suspend such pilot for any term which the wardens may think proper, and in every case of suspension the pilot shall deliver up his license to the wardens, to be by them kept till the time for

which he may have been suspended shall have expired: *Provided always*, That nothing herein contained shall be so construed, as to prevent the owner or consignee of any vessel, or any other person or persons from recovering his or their damages in any court having jurisdiction of the same.

SECT. 32. *And be it further enacted by the authority aforesaid*, That it shall and may be lawful, upon complaint made by any pilot, to the mayor or any alderman in the city of Philadelphia, or to any justice of the peace in any county within this commonwealth, and they are hereby respectively empowered and required to issue forth a precept in writing, under hand and seal in the nature of a summons, capias or attachment, as the case may require, directed to any constable, commanding him to bring or cause to come before such mayor, alderman or justice, any person or persons against whom such complaint shall be made, respecting any demand on masters of vessels, owners, consignees or others, respecting pilotage or other claims as pilots, and thereupon to proceed to hear the proofs and allegations of the said parties, or such of them as shall appear, and to determine and pass judgment thereon, where the same shall not exceed the sum of twenty-six dollars and sixty-seven cents, in like manner as debts not exceeding ten pounds, are by the laws of this commonwealth recoverable, and subject to the like appeal, security, trial and costs, and that all such claim or demand for a sum or sums of money exceeding twenty-six dollars and sixty-seven cents, shall be sued for and recovered with costs of suit by action of debt, case, bill, plaint or information, in any court of record within this state.

SECT. 33. *And be it further enacted by the authority aforesaid*, That every pilot who shall pilot any ship or vessel to the port of Philadelphia, shall within forty-eight hours next after her arrival at the said port, make report thereof to the wardens' office, specifying the name of the master and vessel, and to the best of his information the number of persons on board such vessel; and if any pilot shall neglect or refuse so to do, or knowingly make a false report, he shall forfeit and pay for every such offence the sum of twelve dollars, for the use of decayed pilots, their widows and children, to be recovered as other fines and forfeitures are by this act recoverable.

SECT. 34. *And be it further enacted by the authority aforesaid*, That if any pilot endeavoring to assist or relieve any ship or vessel in distress, shall suffer loss or damage in his boat, her sails, tackle, rigging or appurtenances, the master, owner or consignee of such ship or vessel, shall be liable to pay to such pilot the value of such loss or damage, to be ascertained by the board of wardens, as to them shall appear just.

Sect. 35. *And be it further enacted by the authority aforesaid*, That whenever any person or persons whosoever, shall take or cause to be taken up, within the bay or river Delaware, any anchor or cable, he or they shall bring the same to the port of Philadelphia, and immediately file a written notice thereof, in the office of the wardens of the said port, stating the time when and the place where such anchor or cable was taken up, and shall also cause a copy of such notice forthwith to be inserted in one of the English newspapers of the city of Philadelphia, and continued therein twice a week for the space of two months, unless the owner or owners thereof, his or their agent or agents, shall before the expiration of the said period, file a claim in writing in the said office, to such anchor or cable, and if upon the filing of such claim, sufficient proof of the property of such claimant be made within a reasonable time, to the satisfaction of the board of wardens, every anchor or cable so taken up and claimed as aforesaid, shall be restored to its proper owner or owners, his or their agent or agents; he or they paying to the person or persons so taking up and bringing the same to the said port, one half the value thereof, if taken up between the northernmost part of Reedy Island and the capes of Delaware, and one third of the value thereof, if taken up between the northernmost part of said Island and the port of Philadelphia; which valuation shall be made by two persons, respectively to be chosen by the parties, who in case of disagreement shall appoint a third, whose decision shall be final; but if no claim shall be so filed within the period aforesaid, the anchor or cable so taken up and brought to the said port, shall be vested in and become the property of the person or persons who may have taken up the same; and if any person or persons who shall have so taken up any anchor or cable, neglect or refuse to observe or comply with the directions above mentioned, he or they shall forfeit and pay for every such offence, the sum of fifty dollars, to be sued for, recovered and applied for the use of decayed pilots, their widows and children, by the master warden of the said port: *Provided always*, That if the fine or penalty aforesaid, shall be recovered from any person other than a pilot, the money so recovered shall go to the board of wardens to defray the contingent expenses of said board.

Sect. 36. *And be it further enacted by the authority aforesaid*, That all forfeitures, penalties, sum or sums of money in this act mentioned, or accruing by virtue thereof, and not otherwise directed and appropriated, shall be payable, sued for, recovered and applied in manner and form following; that is to say, all the said forfeitures, penalties, sum and sums of money, in and by this act made payable to the master warden for the time being, shall be sued for and recovered by the said master

warden, with costs of suit, before the mayor or any alderman of the city of Philadelphia, or before any justice of the peace of the county of Philadelphia, or any other county in this state, where the same shall not exceed the sum of twenty-six dollars and sixty-seven cents, in like manner as other debts under ten pounds are by the laws of this commonwealth recoverable, and subject to the like appeal, security, trial and costs, and that all such forfeitures, penalties, sum and sums of money, as shall amount to more than twenty-six dollars and sixty-seven cents, shall be sued for and recovered with costs of suit, by action of debt, case, bill, plaint or information, in any court of record within this state; and that all the fines, forfeitures, penalties, sum and sums of money, received by the master warden or wardens, by virtue of this act, and not otherwise appropriated, shall be by them respectively paid to the state treasurer, once in every three months, for the special use and purpose of paying off the rent, salaries and other incidental expenses arising from the due execution of this act, and all other expenses, costs and charges which have accrued, by the execution of the several acts respecting the wardens of the port of Philadelphia, and to this end all the said fines, forfeitures, penalties, sum and sums of money, so as aforesaid to be paid to the said treasurer, in pursuance of this act, shall remain in the hands of the said treasurer, especially appropriated for the purpose, and subject to the drafts of the said master warden or board of wardens, for all or any of the purposes aforesaid, and for no other use or purpose whatsoever; and to the end and intent that fair and just accounts shall be kept, and settlements made by the said wardens, of all their transactions in pursuance of this act, they are hereby enjoined and required, to exhibit true and just accounts of them once in three months to the register general, who is hereby authorized and required to settle and adjust the same, in like manner as other accounts are settled by him, agreeably to the laws of this commonwealth, subject to the like appeal, security, trial and costs, as in other cases of appeal from any settlement made before him, and in like manner to proceed and recover such balance or balances, as on such settlement or settlements shall be found due from them or any of them.

SECT. 37. *And be it further enacted by the authority aforesaid*, That such law or laws of this commonwealth, as are by this act supplied, be and the same are hereby repealed and made void.

ROBERT WHITEHILL,
Speaker of the Senate.
SIMON SNYDER,
Speaker of the House of Representatives.

Approved March 29, 1803.

THOMAS M'KEAN.

A SUPPLEMENT

To the Act, entitled " An Act to establish a Board of Wardens for the Port of Philadelphia, for the regulation of Pilots and Pilotages, and for other purposes therein mentioned.

SECT. 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, and it is hereby enacted by the authority of the same,* That it shall be the duty of the wardens for the port of Philadelphia, on the application of any person for a license to act as a pilot in the bay or river Delaware, to take to their assistance in the examination of such pilot, two pilots having licenses of the first class, and the person so applying shall pay to the pilots who may assist at such examination, the sum of one dollar each: *Provided,* That from and after the passing of this act, no license to act as a pilot shall be granted to any person under the age of twenty-one years, nor unless he has served a regular apprenticeship for the terms and in the manner prescribed in the eighteenth section of the act to which this is a supplement: And *Provided also,* That this act is not to be construed to deprive persons under the age of twenty-one years, who now have licenses, from enjoying the benefit of the same.

SECT. 2. *And be it further enacted by the authority aforesaid,* That for and during the term of four years from and after the passing of this act, no vessel employed in and licensed for the coasting trade, of a less burthen than one hundred tons, shall be obliged to receive a pilot, or be subjected to the payment of half pilotage, in case of refusal to receive such pilot: *Provided,* That after the expiration of said four years, the exemption of coasting vessels from pilotage, shall be and remain as is provided by the twenty-ninth section of the act to which this is a supplement.

SECT. 3. *And be it further enacted by the authority aforesaid,* That the master of any ship or vessel neglecting to make report to the master warden, agreeably to the twenty-ninth section of the act to which this is a supplement, shall forfeit and pay the sum of ten dollars and no more.

SECT. 4. *And be it further enacted by the authority aforesaid,* That on satisfactory proof being made to the wardens, on oath or affirmation (which oath or affirmation the master warden is hereby authorized to administer) that any pilot, whilst having charge of a ship or vessel was intoxicated with drink, it

shall be the duty of the said wardens to suspend such pilot for any term not less than one year, and in case of such suspension the pilot shall deliver to the wardens his license, to be by them kept till the time for which he may have been suspended shall have expired: And if any pilot who may have been suspended for the reason aforesaid, shall, by satisfactory proof being made to the wardens in the manner aforesaid, be convicted of being a second time intoxicated with drink, whilst having charge of any ship or vessel, such pilot shall be deprived of his license, and be forever thereafter incapable of acting as a pilot for the bay and river Delaware: *Provided*, That nothing herein contained, shall be so construed as to prevent the owner or consignee of any ship or vessel, or any other person or persons from recovering in any court having jurisdiction of the same, for any loss or damage he, she, or they may sustain, in consequence of such misconduct on the part of the pilot.

SECT. 5. *And be it further enacted by the authority aforesaid*, That for and during the term of four years from and after the passing of this act, and no more, the compensation of pilots for conducting ships or vessels from the city of Philadelphia to the capes of Delaware, or from the capes of Delaware to the city of Philadelphia, shall be, for every half foot of water which any inward bound vessel shall draw under and up to twelve feet, one dollar and sixty-seven cents; and for every half foot of water which any such vessel shall draw more than twelve feet, the sum of two dollars and eight cents; and for every half foot of water which any outward bound vessel shall draw under and up to twelve feet, the sum of one dollar twenty-five cents; and for every half foot of water which such vessel shall draw more than twelve feet, the sum of one dollar and sixty-seven cents: *Provided*, that no pilot shall receive any pilotage for any supernumerary inches under six. And *Provided also*, That after the expiration of the four years aforesaid, the pilotage shall be reduced to and be paid at the rate and in the manner provided by the twenty-seventh section of the act to which this is a supplement.

SECT. 6. *And be it further enacted by the authority aforesaid*, That whenever, for the reasons mentioned in the nineteenth section of the act to which this is a supplement, the wardens of the port shall grant certificates to any person to act as pilot for the term of six months, and at the expiration of that time, it shall be made appear to the satisfaction of the said wardens, that any of the persons to whom such certificates are granted, are qualified to act as pilots, it shall be lawful for the wardens to grant them licenses to act as pilots for the bay and river Delaware, and the persons to whom such licenses are granted

shall be entitled to all the privileges and benefits, and subject to the like rules, penalties and forfeitures as other pilots are.

REES HILL,
Speaker of the House of Representatives.

ISAAC WEAVER,
Speaker of the Senate.

APPROVED the thirteenth day of March, one thousand eight hundred and seventeen.

SIMON SNYDER.

Pennsylvania, ss.

Office of the Secretary of the Commonwealth.

In testimony that the foregoing is a true copy of the original law remaining on file, and of record in the said office, I have hereunto set my hand and seal at Harrisburgh, this first day of April, in the year of our Lord one thousand eight hundred and seventeen, and of the Commonwealth the forty-first.

JAMES TRIMBLE,
Deputy Secretary.

Responsibility of Masters of Vessels, Importing persons who may become Chargeable to the Commonwealth.

IF any infant, lunatic, superannuated or maimed person, or any vagabond or vagrant persons, or any person whatsoever, who shall be judged likely to become chargeable to the commonwealth of Pennsylvania, shall be imported into this commonwealth, the master, merchant or importer of such persons, will be compelled to give sufficient security to carry and transport such persons to the place whence he was imported or brought from, or otherwise to indemnify the inhabitants of the commonwealth, from any charge that may come or be brought upon them, under a severe penalty. It is, however, provided—That if any person shall conceive himself aggrieved with any such orders or any judgment, he may appeal to the next Mayor's Court of the city, or to the Court of Quarter Sessions.

LAWS similar to the above, exist in all the commercial towns in the United States, all which lay heavy penalties on persons infringing them.

AN ACT

FOR THE

GOVERNMENT AND REGULATION

OF

SEAMEN IN THE MERCHANTS' SERVICE,

IN THE

UNITED STATES.

SECT. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That from and after the first day of December next, every master or commander of any ship or vessel bound from a port in the United States to any foreign port, or of any ship or vessel of the burthen of fifty tons or upwards, bound from a port in one state to a port in any other than an adjoining state, shall, before he proceed on such voyage, make an agreement in writing or in print, with every seaman or mariner on board such ship or vessel, (except such as shall be apprentice or servant to himself or owners,) declaring the voyage or voyages, term or terms of time, for which such seaman or mariner shall be shipped. And if any master or commander of such ship or vessel shall carry out any seaman or mariner, (except apprentices or servants as aforesaid,) without such contract or agreement being first made and signed by the seamen or mariners, such master or commander shall pay to every such seamen or mariner the highest price or wages which shall have been given at the port or place where such seamen or mariner shall have been shipped, for a similar voyage, within three months next before the time of such shipping: Provided such seamen or mariner shall perform such voyage; or if not, then for such time as he shall continue to do duty on board such ship or vessel: and shall moreover,

forfeit twenty dollars for every such seaman or mariner, one half to the use of the person prosecuting for the same, the other half to the use of the United States: and such seaman or mariner, not having signed such contract, shall not be bound by the regulations, nor subject to the penalties and forfeitures contained in this act.

SECT. 2. *And be it enacted*, That at the foot of every such contract there shall be a memorandum in writing, of the day and the hour on which such seaman or mariner, who shall so ship and subscribe, shall render himself on board, to begin the voyage agreed upon. And if any such seaman or mariner shall neglect to render himself on board the ship or vessel for which he has shipped, and at the time mentioned in such memorandum, and if the master, commander, or other officer of the ship or vessel, shall, on the day on which such neglect happened, make an entry in the log-book of such ship or vessel, of the name of such seaman or mariner, and shall in like manner note the time that he so neglected to render himself, (after the time appointed,) every such seaman or mariner shall forfeit for every hour which he shall so neglect to render himself, one day's pay, according to the rate of wages agreed upon, to be deducted out of his wages. And if any such seaman or mariner shall wholly neglect to render himself on board of such ship or vessel, or having rendered himself on board, shall afterwards desert or escape, so that the ship or vessel proceed to sea without him, every such seaman or mariner shall forfeit and pay to the master, owner, or consignee of the said ship or vessel, a sum equal to that which shall have been paid to him by advance at the time of signing the contract, over and besides the sum so advanced, both which sums shall be recoverable in any court, or before any justice or justices of any state, city, town, or county, within the United States, which by the laws thereof having cognizance of debts of equal value, against such seaman or mariner, or his surety or sureties, in case he shall have given surety to proceed on the voyage.

SECT. 3. *And be it enacted*, That if the mate or first officer under the master, and a majority of the crew of any ship or vessel, bound on a voyage to any foreign port, shall, after the voyage is begun, (and before the ship or vessel shall have left the land,) discover that the said ship or vessel is too leaky, or is otherwise unfit in her crew, body, tackle, apparel, furniture, provisions, or stores, to proceed on the intended voyage, and shall require such unfitness to be inquired into, the master or commander shall, upon the request of the said mate, (or other officer,) and such majority, forthwith proceed to, or stop at, the nearest or most convenient port or place where such inquiry can

be made, and shall there apply to the judge of the district court, if he shall there reside, or if not, to some justice of the peace of the city, or place, taking with him two or more of the said crew who shall have made such request; and thereupon such judge or justice is hereby authorized and required to issue his precept, directed to three persons in the neighbourhood, the most skilful in maritime affairs that can be procured, requiring them to repair on board such ship or vessel, and to examine the same in respect to the defects and insufficiencies complained of, and to make report to him the said judge or justice in writing, under their hands, or the hands of two of them, whether in any, or in what respect, the said ship or vessel is unfit to proceed on the intended voyage, and what addition of men, provisions, or stores, or what repairs or alterations in the body, tackle, or apparel, will be necessary: and upon such report the said judge or justice shall adjudge and determine, and shall endorse on the said report his judgment, whether the said ship or vessel is fit to proceed on her intended voyage, and if not, whether such repairs can be made, or deficiencies supplied, where the ship or vessel then lays, or whether it be necessary for the said ship or vessel to return to the port from whence she first sailed, to be there re-fitted; and the master and crew shall in all things conform to the said judgment; and the master or commander shall, in the first instance, pay all the costs of such view, report, and judgment, to be taxed and allowed on a fair copy thereof, certified by the said judge or justice. But if the complaint of the said crew shall appear, upon the said report and judgment, to have been without foundation, then the said master, or the owner, or consignee of such ship or vessel, shall deduct the amount thereof, and of all reasonable damages for the detention, (to be ascertained by the said judge or justice,) out of the wages growing due to the complaining seamen or mariners. And if, after such judgment, such ship or vessel is fit to proceed on her intended voyage, or after procuring such men, provisions, stores, repairs, or alterations, as may be directed, the said seamen or mariners, or either of them, shall refuse to proceed on the voyage, it shall and may be lawful for any justice of the peace to commit, by warrant under his hand and seal, every such seaman or mariner, (who shall so refuse,) to the common jail of the county, there to remain without bail or mainprize, until he shall have paid double the sum advanced to him at the time of subscribing the contract for the voyage, together with such reasonable costs as shall be allowed by the said justice, and inserted in the said warrant, and the surety or sureties of such seaman or mariner, (in case he or they shall have given any,) shall remain liable for such payment; nor shall any such seaman or mariner

be discharged upon any writ of habeas corpus or otherwise, until such sum be paid by him or them, or his or their surety or sureties, for want of any form of commitment, or other previous proceedings: *Provided*, That sufficient matter shall be made to appear, upon the return of such habeas corpus, and an examination then to be had, to detain him from the causes herein before assigned.

SECT. 4. *And be it enacted*, That if any person shall harbour or secrete any seaman or mariner belonging to any ship or vessel, knowing them to belong thereto, every such person, on conviction thereof, before any court in the city, town or county, where he, she, or they may reside, shall forfeit and pay ten dollars for every day which he, or she, or they shall continue so to harbour or secrete such seaman or mariner, one half to the use of the person prosecuting for the same, the other half to the use of the United States; and no sum exceeding one dollar shall be recoverable from any seaman or mariner, by any one person, for any debt contracted during the time such seaman or mariner shall actually belong to any ship or vessel, until the voyage for which such seaman or mariner engaged shall be ended.

SECT. 5. *And be it enacted*, That if any seaman or mariner who shall have subscribed such contract as is herein described, shall absent himself from on board the ship or vessel, in which he shall so have shipped, without leave of the master, or officer commanding on board; and the mate or other officer having charge of the log book, shall make an entry therein of the name of such seaman or mariner, on the day on which he shall so absent himself, and if such seaman or mariner shall return to his duty within forty-eight hours, such seaman or mariner shall forfeit three days pay for every day which he shall so absent himself, to be deducted out of his wages: but if any seaman or mariner shall absent himself for more than forty-eight hours at one time, he shall forfeit all the wages due to him, and all his goods and chattels which were on board the said ship or vessel, or in any store where they may have been lodged at the time of his desertion, to the use of the owners of the ship or vessel, and moreover shall be liable to pay to him or them all the damages which he or they may sustain, by being obliged to hire other seamen or mariners in his or their place; and such damage shall be recovered, with costs, in any court, or before any justice or justices having jurisdiction of the recovery of debts to the value of ten dollars and upwards.

SECT. 6. *And be it enacted*, That every seaman or mariner shall be entitled to demand and receive from the master or commander of the ship or vessel to which they belong, one

third part of the wages which shall be due to him at every port where such ship or vessel shall unlade and deliver her cargo before the voyage be ended, unless the contrary be expressly stipulated in the contract; and as soon as the voyage is ended, and the cargo or ballast be fully discharged at the last port of delivery, every seaman or mariner shall be entitled to the wages which shall be then due according to his contract; and if such wages shall not be paid within ten days after such discharge, or if any dispute shall arise between the master and seamen or mariners, touching the said wages, it shall be lawful for the judge of the district where the said ship or vessel shall be, or in case his residence be more than three miles from the place, or of his absence from the place of his residence, then for any judge or justice of the peace, to summon the master of such ship or vessel to appear before him, to show cause why process should not issue against such ship or vessel, her tackle, furniture, and apparel, according to the course of admiralty courts, to answer to the said wages; and if the master shall neglect to appear, or appearing shall not show that the wages are paid or otherwise satisfied, or forfeited, and if the matter in dispute shall not be forthwith settled, in such case the judge or justice shall certify to the clerk of the court of the district, that there is sufficient cause of complaint whereon to found admiralty process against the said ship or vessel, and the suit shall be proceeded on in the said court, and final judgment be given according to the course of admiralty courts in such cases used; and in such suit all the seamen or mariners, (having cause of complaint of the like kind against the same ship or vessel,) shall be joined as complainants; and it shall be incumbent on the master or commander to produce the contract and log-book, if required, to ascertain any matters in dispute, otherwise the complainants shall be permitted to state the contents thereof, and the proof of the contrary shall lie on the master or commander; but nothing herein contained shall prevent any seaman or mariner from having or maintaining any action at common law for the recovery of his wages, or from immediate process out of any court, having admiralty jurisdiction, wherever any ship or vessel may be found, in case she shall have left the port of delivery where the voyage ended before payment of wages, or in case she shall be about to proceed to sea before the end of the ten days next after the delivery of her cargo or ballast.

Sect. 7. *And be it enacted*, That if any seaman or mariner, who shall have signed a contract to perform a voyage, shall at any port or place desert, or shall absent himself from such ship or vessel without leave of the master, or officer commanding in the absence of the master, it shall be lawful for any justice of

the peace within the United States, (upon the complaint of the master,) to issue his warrant to apprehend such deserter, and bring him before such justice; and if it shall then appear by due proof that he has signed a contract within the intent and meaning of this act, and that the voyage agreed for is not finished, altered, or the contract otherwise dissolved, and that such seaman or mariner has deserted the ship or vessel, or absented himself without leave, the said justice shall commit him to the house of correction, or common jail of the city, town, or place, there to remain until the said ship or vessel shall be ready to proceed on her voyage, or till the master shall require his discharge, and then to be delivered to the said master, he paying all the costs of such commitment, deducting the same out of the wages due to such seaman or mariner.

SECT. 8. *And be it enacted*, That every ship or vessel belonging to a citizen or citizens of the United States, of the burthen of one hundred and fifty tons or upwards, navigated by ten or more persons in the whole, and bound on a voyage without the limits of the United States, shall be provided with a chest of medicines, put up by some apothecary of known reputation, and accompanied by directions for administering the same; and the said medicines shall be examined by the same, or some other apothecary, once at least in every year, and supplied with fresh medicines in the place of such as shall have been used or spoiled: and in default of having such medicine-chest so provided, and kept fit for use, the master or commander of such ship or vessel shall provide and pay for all such advice, medicine, or attendance of physicians, as any of the crew shall stand in need of, in case of sickness, at every port or place where the ship or vessel may touch or trade at, during the voyage, without any deduction from the wages of such sick seaman or mariner.

SECT. 9. *And be it enacted*, That every ship or vessel belonging as aforesaid, bound on a voyage across the Atlantic Ocean, shall, at the time of leaving the said port from whence she sails, have on board, well secured under deck, at least sixty gallons of water, one hundred pounds of salted flesh meat, and one hundred pounds of wholesome ship-bread, for every person on board such ship or vessel, over and besides such other provisions, stores, and live stock, as shall by the master or passengers be put on board, and in like proportion for shorter or longer voyages; and in case the crew of any ship or vessel which shall not have been so provided, shall be put on short allowance in water, flesh, or bread, during the voyage, the master or owner of such ship or vessel shall pay to each of the crew one day's wages beyond the wages agreed on, for every

day they shall be so put upon short allowance, to be recovered in the same manner as their stipulated wages.

FREDERICK AUGUSTUS MUHLENBERG,
Speaker of the House of Representatives.

JOHN ADAMS,
Vice President of the United States, and President of the Senate.

APPROVED, July 20, 1790,

GEORGE WASHINGTON,
President of the United States.

An Act concerning Consuls and Vice Consuls, and for the protection of American Seamen.

SECT. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That before a clearance be granted to any vessel bound on a foreign voyage, the master thereof shall deliver to the collector of the customs a list containing the names, places of birth, and residence, and a description of the persons who compose his ship's company, to which list the oath or affirmation of the captain shall be annexed, that the said list contains the names of his crew, together with the places of their birth and residence, as far as he can ascertain them; and the said collector shall deliver him a certified copy thereof, for which the collector shall be entitled to receive the sum of twenty-five cents; and the said master shall moreover enter into bond with sufficient security, in the sum of four hundred dollars, that he shall exhibit the aforesaid certified copy of the list to the first boarding officer at the first port in the United States at which he shall arrive on his return thereto, and then and there shall produce the persons named therein to the said boarding officer, whose duty it shall be to examine the men with such list, and report the same to the collector; and it shall be the duty of the collector at the said port of arrival, (where the same is different from the port from which the vessel originally sailed,) to transmit a copy of the list so reported to him to the collector of the port from which said vessel originally sailed: *Provided,* That the said bond shall not be forfeited on account of the said master not producing to the first boarding officer, as aforesaid, any of the persons contained in the said list, who may be discharged in a foreign country with the consent of the consul, vice consul, commercial agent, or vice commercial agent there residing, signified in writing, under his hand and official seal, to be produced

to the collector with the other persons composing the crew as aforesaid; nor on account of any such person dying or absconding, or being forcibly impressed into other service, of which satisfactory proof shall be then also exhibited to the collector.

SECT. 2. *And be it enacted*, That it shall be the duty of every master or commander of a ship or vessel, belonging to citizens of the United States, who shall sail from any port of the United States, after the first day of May next, on his arrival at a foreign port, to deposit his register, sea letter, and Mediterranean passport, with the consul, or vice consul, commercial agent, (if any there be at such port) and in case of refusal or neglect of the said master or commander to deposit the said papers as aforesaid, he shall forfeit and pay five hundred dollars, to be recovered by the said consul, vice consul, commercial agent, or vice commercial agent in his own name, for the benefit of the United States, in any court of competent jurisdiction; and it shall be the duty of such consul, vice consul, commercial agent, or vice commercial agent, on such master or commander producing to him a clearance from the proper officer of the port where the ship or vessel may be, to deliver to the said master or commander all his said papers: *Provided*, such master or commander shall have complied with the provisions contained in this act, and those of the act to which this is a supplement.

SECT. 3. *And be it enacted*, That whenever a ship or vessel belonging to a citizen of the United States, shall be sold in a foreign country, and her company discharged, or when a seamen or mariner, a citizen of the United States, shall with his own consent be discharged in a foreign country, it shall be the duty of the master or commander to produce to the consul, vice consul, commercial agent, or vice commercial agent, the list of his ship's company, certified as aforesaid, and to pay to such consul, vice consul, commercial agent, or vice commercial agent for every seamen or mariner so discharged, being designated on such list as a citizen of the United States, three month's pay over and above the wages which may be due to such mariner or seaman, two thirds thereof to be paid by such consul or commercial agent, to each seaman or mariner so discharged, upon his engagement on board of any vessel to return to the United States, and the other remaining third to be retained for the purpose of creating a fund for the payment of the passages of seamen or mariners, citizens of the United States, who may be desirous of returning to the United States, and for the maintenance of American seamen who may be destitute, and may be in such foreign port, and the several sums retained for such fund shall be accounted for with the treasury every six months by the persons receiving the same.

SECT. 4. *And be it enacted*, That it shall be the duty of the consuls, vice consuls, commercial agents, and vice commercial agents of the United States, from time to time, to provide for the mariners and seamen of the United States, who may be found destitute within their districts respectively, sufficient subsistence, and passages to some port in the United States, in the most reasonable manner, at the expense of the United States, subject to such instructions as the secretary of state shall give; and that all masters and commanders of vessels belonging to citizens of the United States, and bound to some port of the same, are hereby required and enjoined to take such mariners or seamen on board of their ships or vessels, at the request of the said consuls, vice consuls, commercial agents, or vice commercial agents, respectively, and to transport them to the port in the United States, to which such ships or vessels may be bound, on such terms, not exceeding ten dollars for each person, as may be agreed between the said master and consul, or commercial agent. And the said mariners or seamen shall, if able, be bound to do duty on board such ships or vessels according to their several abilities: *Provided*, That no master or captain of any ship or vessel shall be obliged to take a greater number than two men to every one hundred tons burthen of the said ship or vessel, on any one voyage; and if any such captain or master shall refuse the same on the request or order of the consul, vice consul, commercial agent, or vice commercial agent, such captain or master shall forfeit and pay the sum of one hundred dollars for each mariner or seamen so refused, to be recovered for the benefit of the United States, in any court of competent jurisdiction. And the certificate of any such consul or commercial agent, given under his hand and official seal, shall be *prima facie* evidence of such refusal in any court of law having jurisdiction for the recovery of the penalty aforesaid.

SECT. 5. *And be it further enacted*, That the seventh and eighth sections of the act entitled "An act concerning consuls and vice consuls," be, and the same are hereby repealed: and that the secretary of state be authorized to reimburse the consuls, vice consuls, commercial agents, or vice commercial agents, such reasonable sums as they may heretofore have advanced for the relief of seamen, though the same should exceed the rate of twelve cents a man per diem.

SECT. 6. *And be it further enacted*, That it shall and may be lawful for every consul, vice consul, commercial agent, or vice commercial agent of the United States, to take and receive, for every certificate of discharge of any seamen or mariner in a foreign port, fifty cents; and for commission on paying and receiving the amount of wages payable on the discharge of seamen in foreign ports, two and a half per cent.

SECT. 7. *And be it further enacted,* That if any consul, vice consul, commercial agent, or vice commercial agent shall falsely and knowingly certify that property belonging to foreigners is property belonging to citizens of the United States, he shall, on conviction thereof in any court of competent jurisdiction, forfeit and pay a fine not exceeding ten thousand dollars, at the discretion of the court, and be imprisoned for any term not exceeeding three years.

SECT. 8. *And be it further enacted,* That if any consul, vice consul, commercial agent, or vice commercial agent, shall grant a passport or other paper certifying that any alien, knowing him or her to be such, is a citizen of the United States, he shall, on conviction thereof in any court of competent jurisdiction, forfeit and pay a fine not exceeding one thousand dollars.

SECT. 9. *And be it further enacted,* That all powers of attorney executed after the twentieth day of June next, in a foreign country, for the transfer of any stock of the United States, or for the receipt of interest thereon, shall be verified by the certificate and seal of the consul, vice consul, commercial agent, or vice commercial agent, if any there be at the place where the same shall be executed, for which the person giving the certificate shall receive fifty cents.

NATH. MACON,
Speaker of the House of Representatives.

A. BURR,
Vice President of the United States, and President of the Senate.

Approved, February 28, 1803.

TH. JEFFERSON,
President of the United States.

Extract of an Act for the Relief and Protection of American Seamen.

AND, in order that full and speedy information may be obtained of the seizure or detention, by any foreign power, of any seaman employed on board any ship or vessel of the United States: *Be it further enacted,* That it shall and is hereby declared to be the duty of the master of every ship or vessel of the United States, any of the crew whereof shall have been impressed or detained by any foreign powers, at the first port at which such ship or vessel shall arrive, if such impressment or detention happened on the high seas, or if the same happened within any foreign port, then in the port in which the same hap-

pened, immediately to make a protest, stating the manner of such impressment or detention, by whom made, together with the name and place of residence of the person impressed or detained; distinguishing also whether he was an American citizen, and if not to what nation he belonged. And it shall be the duty of such master to transmit by post or otherwise, every such protest made in a foreign country to the nearest Consul or Agent, or to the Minister of the United States resident in such country, if any such there be, preserving a duplicate of such protest, to be by him sent immediately after his arrival within the United States, to the Secretary of State, together with information to whom the original protest was transmitted: And in case such protest shall be made within the United States or in any foreign country, in which no Consul, Agent or Minister of the United States resides, the same shall, as soon thereafter as practicable, be transmitted by such master, by post or otherwise, to the Secretary of State.

And be it further enacted, That a copy of this law be transmitted by the Secretary of State, to each of the Ministers and Consuls of the United States, resident in foreign countries, and by the Secretary of the Treasury, to the several Collectors of the district of the United States, whose duty it is hereby declared to be, from time to time, to make known the provisions of this law, to all masters of ships and vessels of the United States entering or clearing at their several offices. And the master of every such ship or vessel shall before he is admitted to an entry, by any such collector, be required to declare on oath, whether any of the crew of the ship or vessel under his command have been impressed or detained, in the course of his voyage, and how far he has complied with the directions of this act: And every such master as shall wilfully neglect or refuse to make the declarations herein required, or to perform the duties enjoined by this act, shall forfeit and pay the sum of one hundred dollars. And it is hereby declared to be the duty of every such Collector to prosecute, for any forfeiture that may be incurred under this act.

Further regulations respecting seamen on their refusing to defend the ship.—If any mariners or inferior officers, of any merchant ship, shall decline or refuse to defend the ship, or utter words to discourage others from doing so; every mariner so behaving shall lose all his wages, together with such goods as he may have in the ship, and suffer imprisonment; and every mariner who shall have laid violent hands on his commander, to hinder him from fighting in defence of his ship and goods, shall suffer death as a felon. 22 and 23 Carl. II. c. ii. 7 and 9.

Wilfully losing the ship.—If any master, mariner, &c. wilfully cast away, burn or destroy his ship, or cause the same to be done, he shall suffer death. *Raymond's Rep.* p. 650.

Negligence of the mariners.—Masters may reimburse themselves out of the wages of the mariners for losses happening by their negligence.

Suing for wages in the United States' District Court, which is the same as the Court of Admiralty in England.—The convenience arising to mariners on suing for wages in the District Court is so great, that out of regard to that useful body of men, it is permitted that they may sue for wages there. But although this liberty is permitted to mates and mariners, it is denied to the master; for the master contracts upon the credit of the owners, and the mariners upon the credit of the ship. The convenience and benefit accruing to the mariner from this practice are, that they may all join in suit there, for wages, (thereby lessening the expense) which could not be done by the usual courts of the county. In the district court, the ship itself is answerable and not the owners.

If the voyage be changed during the voyage, the mariners are not obliged to continue in the ship: unless it has been specified in the articles or contract before sailing on the voyage.

In what cases wages are due.—If the ship be lost before she arrives at any port of delivery, the seamen lose all their wages. If she be lost after coming to a port of delivery, they only lose their wages from the last port of delivery, even though the officers and mariners sign a contract not to demand wages unless the ship return to the United States. If seamen run away, after arriving at a port of delivery, they lose all their wages.

If a ship outward bound, arrives at her destined port, unloads there, receives a freight to return to the United States, and is taken by the enemy on her return, the mariners are intitled to their wages only to the last port of delivery, or the port she unloaded in, and nothing for loading the return cargo.

If a seaman be impressed before the ship arrives at the delivering port, and the ship afterwards arrives safe, his wages are recoverable for the time he served.

An action was brought by a sailor for wages, on a voyage from Branstaple to Newfoundland, and from thence to Spain, Portugal, or some port in the Mediterranean. The ship was taken after her arrival at Newfoundland, and the action was brought for the wages due on that part of the voyage, the verdict was given in favour of the sailor, but on motion for a new trial, it was the opinion of the court, that it was one entire voyage: the first was only the loading of ship no matter where taken in; and the ship was lost before her arrival at the port of delivery. As the freighter lost his cargo, the mariner ought to lose his wages.

A ship sailed from Rhode Island on a voyage to St. Petersburgh; she arrived safe there and took in a cargo. On her homeward bound passage, she was captured by a Danish pri-

vateer, and sent into Norway, where she was detained nearly two years with her original crew on board. She was finally condemned there by the Danish Court. The sailors of the ship sued for wages after their return to Rhode Island; but they only recovered wages to the time of the last port of delivery, which was St. Petersburgh, that is until her outward cargo was discharged—nothing while loading.

A cargo of a ship was lost by the capture of a Swedish privateer, who carried her into Gottenburgh. The master staid there three months to refit and take in new lading; and to prevent the seamen from leaving the ship, he agreed to pay them so much a month while they staid there. And in the action for this, the master would have discharged himself on the rule that freight is the mother of wages, which the chief justice agreed to be the general doctrine, but he held it not sufficient to set aside a special agreement, as there was in this case. The seamen, therefore, recovered their wages.

Regulations for Ships or Vessels within the port or harbour of Philadelphia.

And be it further enacted, &c. That if any master or captain of any ship or vessel, shall refuse or neglect to comply with the directions of said Harbour Master, in matters within the jurisdiction of his office, or if any person whoever, shall obstruct or prevent the said Harbour Master in the execution of his duties, such master, captain, or other person, shall, for each and every such offence, severally forfeit and pay any sum not exceeding one hundred dollars. And the said Harbour Master shall, in full compensation for his services, be entitled to have, recover, and receive, from the master, captain, owner, or consignee, of each and every ship or vessel, arriving at the port of Philadelphia, coasting vessels not exceeding the burthen of seventy-five tons excepted, the sum of one dollar, for each and every voyage by such ship or vessel performed, and no more.

First. Every ship or vessel that may arrive in this harbour, and that shall come to anchor in the stream, any where between Almond and Vine streets, having previously caused her gunpowder, if any she had on board, to be landed, as the law directs, may remain in that situation twenty-four hours, and no longer, taking care to lay as near to the island or sand bar, as may be consistent with their safety. But, if from the circumstance of a vessel having servants on board, or from any other cause, it may be thought necessary or convenient to lay a longer time in the stream, then, and in every such case, the

owner, master, pilot, or other person, having the charge or direction of such vessel, shall remove her from opposite the city, and shall moor her (or cause her to be moored to the northward of Vine street) with one anchor and cable up, and one anchor and cable down the stream ; and in both the above mentioned situations, the regulations contained in the next succeeding article to be duly attended to..

Second. When any ship or vessel shall be hauled in to any wharf or dock, or along side of another vessel that may be lying at such wharf or dock, the owner, master, pilot, or whoever may have the command, care or direction of her, shall have her securely made fast; and if outside of another vessel, shall get one good fast from each end of the vessel to the shore, with sufficient fenders between them and the inside vessel, and shall cause the flews of their anchors to be taken in board, and within twenty-four hours thereafter cause her jib boom, spritsail yard, main boom, spanker, and ringtail booms, if any they have, to be rigged in, and their lower yards topped up, in such a manner as least to interfere with vessels passing.

Third. If any vessel, properly moored in the stream, shall have her anchor or cable overlaid by another vessel, in anchoring or mooring, the master or person having the care or direction of such last mentioned vessel, shall immediately, or soon as may be, after application made to him by the party aggrieved, cause the said anchor or cable, so overlaying, to be taken up and cleared.

Fourth. If the fasts of vessels when moored at a wharf, shall extend across a dock, so as to obstruct the passing or repassing of shallops, lighter or other craft or vessel, the master, or other person having the command of such ship or vessel, shall, upon the first application, immediately cause such fast or fasts to be cast off or slacked down.

Fifth. No outward bound vessel, putting off from a wharf, shall lay longer in the stream between Vine street and Almond, in the district of Southwark, above mentioned, than twenty-four hours. And if vessels lying at the end of wharves, so much interlock with each other, as to prevent vessels hauling in and out of docks, the master, owner, pilot, or other person having the charge of the same, shall, immediately on application from any person so wanting to haul his vessel in or out of the dock aforesaid, have the vessel or vessels so interfering, moved in such a manner as to accommodate the one applied for; in which case, the vessel making rcom for another to haul in or out, shall have liberty to make her warps fast to the most convenient place adjacent, for a reasonable time, and that all sea vessels, when transporting or wanting to haul into a wharf

or dock, or to make sail in order to proceed to sea, shall have the same privilege.

Sixth. When any ship or vessel may be lying alongside any wharf and not taking in or discharging, she shall make way for, and permit any vessel that wants to unload or load, to come inside next the wharf, until she discharges or loads her cargo; and the said vessel when so discharged, or loaded, shall haul outside, and give way to the vessel that first occupied the wharf: *Provided*, that from the 10th day of December to the 1st of March, no vessel shall be compelled to move from her birth, excepting to let vessels in and out of docks.

Seventh. No ship or vessel loading or discharging hemp at any wharf, or within any dock, shall be allowed to have any fire on board: neither shall any vessel laying outside or near her, be permitted to have fire on board, while it may be considered dangerous. And no tar, turpentine, rosin, or pitch, shall be heated on the wharf, or on board any vessel laying at any wharf within the limits of the city.

MARINE ASSURANCES.

Assurance is a contract by which the assurer undertakes, in consideration of a premium equivalent to the hazard run, to indemnify the person assured against certain perils and losses, or against some particular event. All assurances, whether against fire or on lives, fall within this general description; but the subject meant to be considered here is that of Marine Assurances. From this definition it appears to be a contract of *indemnity* against those perils to which ships and goods are exposed in the course of their voyage from one place to another.

The *origin of assurance* has occasioned much doubt among the writers upon mercantile law. Indeed, it is involved in so much obscurity, that, after all the researches which have been made, any very satisfactory solution of this doubt cannot be promised. One truth, however, is clear, that, wherever commerce extended its influence, assurance must have soon followed as a necessary attendant, it being impossible to carry on any very extensive trade without it, especially in the time of war. Some writers have ascribed the origin of this contract to Claudius Cæsar, the fifth Roman emperor. Other respectable authorities have given the honour of it to the Rhodians, thus laying a foundation for the idea that the law of assurance had obtained a place in most of the ancient codes of jurisprudence. The minute consideration of this question through those remote times would be attended with little satisfaction; the mind, perhaps, is more gratified to know, from authentic history, that it was introduced into England by the active and industrious *Lombards*, who came hither in the thirteenth century; and that, whatever might have been its imperfect infant state, about the end of the fifteenth century, many considerable regulations were made at Barcelona, in Spain, respecting marine assurances. The progress which this branch of law had made in England previously to the time of Lord Mansfield was very low; but, during the long period that venerable judge presided in the court of King's Bench, its progress towards perfection was equally rapid.

A complete system cannot be suddenly erected; but it is the boast of this age, that in it the great foundations of marine jurisprudence have been laid, by clearly developing the principles on which policies of insurance are founded, and by applying those principles to particular cases. In the following treatise we shall endeavour to render the law of it so clear as to be a guide to the merchant, owner, freighter, and man of business. To effect this, we have divided the subject, and it will be discussed in the following order:

I.—*The Policy.*

The Policy is the instrument by which the contract of indemnity is effected between the assurer and assured; and it is signed only by the assurer, who is called the underwriter. Of policies there are two kinds, *valued* and *open;* and the only difference between them is this, that, in the former, goods or property assured are valued at prime cost, at the time of effecting the policy; in the latter, the value is not mentioned, but, in case of loss, must be proved.

Policies of assurance, when once they are underwritten, can, generally speaking, never be altered by any authority whatever; because it would be an opening to fraud, and would introduce

uncertainty into a species of contract, of which certainty and precision are the most essential requisites. It must be observed, however, that cases frequently exist, in which a policy, *upon proper evidence*, may be altered; and, after signing, policies are frequently altered by *consent* of the parties.

An instance of the former kind, of the alteration of the policy, occurred before Lord Hardwicke. The assurance was upon the ship five hundred pounds, and the policy stated, that the adventure was to commence immediately *from the departure of the ship from Fort St. George to London.* The plaintiff suggested that the owner had employed a Mr. Halhead to assure the ship with the defendants, to commence *from her arrival at Fort St. George;* that a label, agreeably to those instructions, with all the particulars of the agreement, had been entered into a book, and subscribed by Halhead, and two of the directors of the company; that, by a *mistake*, the policy was made out different from the label; that the ship being lost in the Bay of Bengal, *after* her arrival at Fort St. George, but *before* her departure for England, the company refuse to pay; the plaintiff therefore prayed that the mistake might be rectified, and that the company might be ordered to pay five hundred pounds with interest. His Lordship was of opinion, that the label was a memorandum of the agreement, in which the material parts of the policy were inserted: that, although the policy was ambiguous, the label made it clear; and, as it was only a *mistake of the clerk*, it ought to be rectified according to the label.—*Motteux* v. *the Governors and Company of the London Assurance*, 1 Atkyns, 545.

How far the *consent of the parties* is necessary, may be judged of by the following case. The assurance was on a ship and cargo from Liverpool to Oporto. The ship sailed, but was driven back by contrary winds; and, before she could sail again, an embargo was laid. The assured applied to the underwriters for leave to put guns on board, and to take out a letter of marque. The underwriters consented to the guns for her defence, but refused the letter of marque. Notwithstanding which, a general letter of marque was obtained, and put on board. The ship sailed, and was taken on her voyage out. The jury thought that the letter of marque was intended to be used only in the voyage home. The court, however, determined that this vacated the policy.—*Denison* v. *Modigliani*, 5 Term Rep. K. B. 580.

A policy of assurance is the property of the assured; and, if it be *wrongfully* withheld, either by his broker or any other person, he may recover it by an action of trover.—*Harding* v. *Carter* and another; sittings at Guildhall. Easter vacation, 1781.

Policies of assurance are generally printed, leaving blanks for the insertion of names and all other requisites. It is therefore frequently necessary to insert written clauses; and these written clauses and conditions, thus inserted, are to be considered as part of the real contract; the court will look to them to find out the intention of the parties, and will consequently suffer such condition to control the printed words.

We will now proceed to consider, first, what persons may be the assurers: secondly, what things may be assured: thirdly, what the requisites of a policy are.

1st. *What Persons may be Assurers.*

By virtue of the statute of the 6 Geo. I. c. 18, the two offices, under the names of the Royal Exchange Assurance Office, and the London Assurance Office, were created and established by charter of George the First, under the great seal of Great Britain, bearing date the twenty-ninth of April, in the seventh year of his reign; and they still continue offices for assurance of property, within any of his majesty's dominions. But the business of assurance is not confined to these two societies; for, private persons may be assurers, provided they do not *assure in co-partnership.* It must here be understood, that, although there may be twenty names to a policy, it is not one joint contract, but as many separate contracts as there are names subscribed. And therefore any person, since this statute, may assure as at the common law, with this single exception, that any policy, subscribed by a private firm or *partnership*, is absolutely void. *Sullivan* v. *Greaves.* Sittings after Easter, 1789.

This doctrine subsequently received the unanimous confirmation of the Court of Common Pleas, in which an action was brought (by Mitchell and others, assignees of Robertson, a bankrupt, against Cockburn, assignee of Tyler, a bankrupt) for a moiety of losses paid by Robertson, who had been in partnership with Tyler for the assurance of ships, but which partnership was carried on in the name of Robertson only. Lord Chief Justice Eyre, in delivering his opinion, said, "This question depends on the 6 Geo. I. cap. 18. s. 12; by which act the two corporations became the purchasers of the exclusive privilege of assuring on a *joint* stock; and to give effect to that privilege, all other persons are prohibited from assuring on a joint stock. Now it appears clearly, that the provisions of this act are at an end, if a person, by merely assuring in his own name, can have the advantage of a joint capital, which the act meant to prohibit. The partnership is therefore contrary to the spirit of the act, and also to the letter of it." The other judges concurring, the plaintiff was nonsuited. 2 H. Blackst. Rep. 379.

Subsequent cases have been decided conformably hitherto.— *Booth* v. *Hodgson*, 6 Term Rep. 405.

Associations have, however, of late years been entered into by ship owners for the purpose of *mutually* assuring each other's property; and upon these, two cases have been decided. The first was an action tried at the sittings after Mich. Term, 1796, before Lord Kenyon. It was on two policies of assurance on the Ann and Elizabeth, from Dantzick to London. The plaintiff and defendant were members of the "*Whitby Association*," consisting of a number of persons, owners of ships, each of whom, in proportion to his shipping, paid a certain sum, which formed the stock of the society. The policies were signed by all the members. All assured for each other, according to the respective values of their ships; and, when any loss happened, the treasurer paid it out of the joint stock. The defendant's share was fourteen pounds; each individual being liable only for the sum he had undertaken. Lord Kenyon said, "This does not infringe on the act of parliament, as the members of this association have only underwritten in their individual characters: but they cannot underwrite for themselves and partners. If all of them were liable up to the extent of their whole stock, it would be illegal. At present the members of this association only stand as individual underwriters for small sums." The plaintiff of course recovered. *Harrison* v. *Miller*, 7 Term Rep. 740.

The second case that has arisen upon these associations was an action brought (not on a policy of assurance, but) on articles of agreement, dated April 11, 1787, made between the defendant and certain other persons (therein named and described as several owners and part owners of ships) of the first part, and the plaintiff of the other part; by which it was covenanted and agreed, by the parties to the same, *severally* and not jointly to assure the ships belonging to the several parties from the 1st of June then next for 21 years, subject to certain conditions and regulations: one of which regulations was, "that in case any member of the company should *become insolvent* or *unable* to pay his proportionable part of any loss that might happen, the proportionable part of such insolvent member should be made good *by the other members* of the company." Upon this regulation the court were of opinion, that a *joint responsibility* arose, and that therefore the plaintiff could not recover, because it was contrary to the act of parliament just mentioned. *Lee* v. *Smith*, Term Rep. 338.

If a ship be assured with one underwriter, and the freight with another, and the assurer on the freight shall pay the assured the sum he subscribed, as for a total loss, he shall afterwards be entitled to recover the said sum, if the ship be subseq

quently liberated and earn freight of the assured. The expenses on the ship before abandonment must be borne by the underwriters of the ship; nor shall any preference be given to their claims on account of priority of assurance. *Thompson* v. *Rowcroft*, Term Rep. Trinity 43 Geo. III.

2dly. *What Things may be assured.*

The most frequent subjects of marine assurance are *ships*, *goods*, *merchandises*, and the *freight* or *hire* of ships. But, although assurances upon such property most frequently occur, yet there are cases which can hardly fall within any of those descriptions.—1 Magens, 4.

Thus *bottomry* and *respondentia* are a particular species of property which may be the subject of assurance. But then it must be particularly expressed in the policy to be *respondentia* interest; for under a general assurance on *goods*, the party assured cannot recover money lent on *bottomry*. Such has been, and is at this day, the established usage of merchants.

This was decided in an action upon a policy of assurance "upon *goods and merchandises*, loaden, or to be loaden, &c." The evidence appears to be, that, before the signing of the policy, the plaintiff had lent Capt. Tryon, *upon the goods* then loaden and to be loaden on board the said ship, on account of the said Capt. Tryon, the sum of 764*l.* at *respondentia*, for which a bond was executed in the usual form: that the ship at the time of the loss had goods and merchandises on board, the property of Capt. Tryon, of greater value than all he borrowed: that the ship was afterwards burnt, and all the goods and merchandises were totally consumed and lost. Upon these facts, the question was, whether the plaintiff could recover. This case was twice argued at the bar; the court took time to consider it, and were unanimous in their determination.

Lord Mansfield, in delivering the judgment of the court, observed to this effect: "I inclined to support this assurance, being convinced that it is fair, and that a doubt has arisen by a slip in omitting to specify (as it was intended to have been done) that this was a *respondentia* interest. The ground of supporting this assurance, if it could have been supported, was a clause of the 19th Geo. II., c. 37, s. 5., which, as to the purpose of assurance, considers the borrower as having a right to assure only for the surplus value, over and above the money he has borrowed at *respondentia*. Yet we are all satisfied that this act of parliament never meant, or intended to make, any alteration in the manner of assurances; its views were to prevent gaming or wagering policies, where the insurer had no interest at all; and, if the lender of money at *respondentia* were to be at liberty to assure for more than his whole interest, it would be a gaming

policy; for, it is obvious that, if he could assure all the goods, and assure his *respondentia* interest besides, this would amount to an assurance beyond his whole interest.

In describing *respondentia* interest, the act gives the lender *alone* a *right* to make assurance on the money lent: so that the act left it on the practice. I have looked into the practice, and I find that bottomry and *respondentia* are a *particular species* of assurance in themselves, and have taken a particular denomination; I cannot find even a *dictum* in any writer, foreign and domestic, that the *respondentia* creditors may assure upon the *goods as goods*. I find, too, by talking with intelligent persons, very conversant in the knowledge and practice of assurances, that they always do mention *respondentia* interest, whenever they mean to assure it. It might be greatly inconvenient to introduce a practice *contrary to general usage*, and there may be some opening to fraud if it be not specified. The ground of our resolution is, "That it is now established as the law and practice of merchants, that *respondentia* and bottomry must be specified and mentioned in the policy of assurance."—*Glover* v. *Black*; 3 Burr. 1394, and 1 Blackst. Rep. 405.

But, though this case is certainly good law, yet it has since been ruled, that money expended by the captain for the use of the ship, and for which *respondentia* interest was charged, may be recovered under an assurance on *goods*, *specie*, *aud effects*, provided *the usage of the trade*, which in matters of assurance is always of great weight, sanction it.

Thus, in an action upon a policy of assurance *on goods*, *specie and effects*, of the plaintiff, who was also the captain on board the ship, the plaintiff claimed under that assurance, money expended by him in the course of the voyage for the use of the ship, and for which he charged "*respondentia* interest." Lord Mansfield said, as to whether the words "*goods*, *specie*, *and effects*," extended to this interest, I should think not, if we were only to consider the words made use of. But here there is *an express usage*, which must govern our decision. A great many captains in the East India service swear, that this kind of interest is always assured in this way, and here the person assured is the *captain*. *Gregory* v. *Christie*, K. B., Trinity Term, 24 Geo. III.

Captors of ships secured as prize may assure their interest therein before condemnation; nor are they entitled to a return of premium, if the capture be ultimately adjudged no prize; and restitution be awarded to the owners by the court of admiralty.

Assurances upon the wages of seamen are forbidden;* a

* In Scotland, however, such assurances are by no means without example; and have never been the subject of litigation. Millar's Law of Assurances.

regulation founded in wisdom and sound policy; (1 Magens 18, 19:) and, indeed, the general policy of the law of this country supports this regulation; for, by 1 Geo. I., c. 24, § 7, "no master or owner of any merchant ship shall pay to any seaman, beyond the seas, any money or effects, *on account of wages*, exceeding one moiety of the wages due, at the time of such payment, till such ship shall return to Great Britain or Ireland." By this salutary law, the sailors are interested in the return of the ship; and they will on that account, be prevented from deserting it when abroad, from leaving it unmanned, and will be more anxious for its preservation. This regulation, however, does not mean to prevent mariners from assuring those wages which they are entitled to receive abroad, or goods which they have purchased with those wages in order to bring them home: but, in such a case, they are to be considered in the same light with other men.

It has, however, been determined, that, where the mate of a ship or a sailor is to receive something at the end of the voyage, in lieu of wages, he cannot assure it, any more than he could assure wages payable in money. *Webster* v. *De Tastet*; 7 Term Rep. 157.

The *profits* of a cargo employed to trade on the coast of Africa are assurable. *Barclay* v. *Cousins*, Term Rep., Trinity, 42 Geo. III.

Goods may be assured, though purchased with the proceeds of a former illegal cargo.

It has long been a question how far assurances upon the ships or goods of enemies are politic; but no doubts were entertained concerning the *legality* of such assurances in Great Britain, although the question remained undecided till lately.

It should be observed, that, in the year 1748, a bill was introduced into parliament to prohibit such assurances during the then existing war with France, and passed into a law. The operation of that act was limited to the period of that war. The necessity for passing this act seemed to warrant the conclusion, that such assurances would have been legal, unless so prohibited: accordingly, too, a similar temporary act of parliament, (33 Geo. III., c. 27, § 4,) was passed at the commencement of the last war: but the court of King's Bench having decided, in two subsequent cases, *against* the legality of these assurances, independently of the acts of parliament, we must now consider these assurances upon the property of an open enemy as absolutely void. 6 Term Rep. 23 and 35.

3dly. *Of the Requisites of a Policy.*

The essentials in a policy of assurance are: First, the name of the person for whom the assurance is made; Secondly, the

names of the subscribers or underwriters, and the sums assured: Thirdly, the names of the ship and master: Fourthly, whether they are ships, goods, or merchandises, upon which the assurance is made: Fifthly, the name of the place where the goods are laden, and whither they are bound: Sixthly, the time when the risk begins, and when it ends: Seventhly, all the various perils and risks which the assurer takes upon himself: Eighthly, the consideration, or premium, paid for the risk or hazard run: Ninthly, the month, day, and year, on which the policy is executed: Tenthly, the stamps required by act of parliament.

First, Of the Names of the Persons assured.

The statute of 28 Geo. III., chap. 56, declares, "That it shall not be lawful, from and after the passing of that act, for any person or persons to make or effect, or cause to be made or effected, any policy of assurance on any ship or vessel, or upon any goods, merchandises, effects, or other property whatsoever, without first inserting, or causing to be inserted, in such policy, the name or names, or the usual style and firm of dealing, of one or more of the persons interested in such assurance; or, without, instead thereof, first inserting the name or names of the usual style and firm of dealing of the consignor or consignors, consignee or consignees, of the goods and property so to be assured; or the name or names, of the usual style and firm of dealing, of the person or persons, residing in Great Britain, who shall receive the order for and effect such policy, or of the person or persons who shall give the order or directions to the agent or agents immediately employed to negociate or effect such policy. The statute farther declares, that every policy made or underwritten contrary to the true intent and meaning of this act shall be null and void to all intents and purposes."

Upon this act it has been decided, that it is not necessary, where a policy is effected by an agent, to add the word *agent*, or any other description to his name, in the policy itself; and it has also been decided that, a policy effected by a broker, describing himself thereon as *agent*, is a sufficient compliance with the act of parliament.—*Devigniez* v. *Swanson*, K. B., Mich., 39 Geo. III.—*Bell* v. *Gibson;* Bosanquet and Puller's Rep., 1 vol., 345.

A plea of the plaintiff's being an alien is not valid, unless he be proved a native of a foreign country at enmity with this country, and that he have arrived here without letters of safe conduct from our king. *Casseres* v. *Bell*, 8 Term Rep. 166.

If the assured be a liege subject of one country, and a citizen of another for the purposes of commerce, the circumstance of

being born in a former cannot deprive him of the benefit of his naturalization in the latter. *Wilson* v. *Marryatt*, 8 Term Rep. 31.

Secondly. The names of the Subscribers or Underwriters, and sums another time insured.

This indeed was always requisite; as, without it, there would be no assurer. The act of 35 Geo. III., c. 63., § 11, declares, that policies wanting this are null and void.

Thirdly. Of the Names of the Ship and Master.

It seems to be necessary, by the law and usage of merchants, to insert the names of the ship and master, in order to ascertain the bottom upon which the adventure is to be made, and the captain by whose direction the ship is to be navigated. Sometimes, however, there are assurances generally, "upon any ship or ships" expected from a particular place; and, although it is more accurate to insert the name of the captain, it is not certain that the assurance would be void, if a different captain from that mentioned in the policy came into the ship; especially as the policy always contains the words—"or whosoever else shall go for master in the said ship."

With respect to assurances *upon any ship or ships*, it has been recently determined, that they are not only legal and valid, but that the assured has a right to cover, by such policy, whatever ship he thought proper that fell within the term of it.—*Kewley* v. *Ryan*, 2 H. Blackst. Rep. 343.

Fourthly, Whether they are Ships, Goods, or Merchandises, upon which the Assurance is made.

It is absolutely necessary that there should be a specification upon *which* of these the underwriter assures. But it is another question, whether, in policies upon goods, it be necessary to declare the *particulars*. The practice is very unsettled: in the opinion, however, of very respectable merchants, the particulars of goods should be specified, if possible, by their marks, numbers and packages, and not under the general denomination of merchandise, (1 Magens, 8.) When goods are coming from abroad, it is better to assure under general expressions, on account of the various casualties which may happen to obstruct the purchase of the commodities intended to be sent.

There are certain kinds of merchandise which are of a perishable nature, on account of which, there is inserted a memorandum at the foot of the policy, by which it is declared, that, in assurances upon corn, fish, salt, fruit flour, and seed, the un-

derwriters will not be anwerable for any partial loss, but only for general average, except the ship be stranded. That, in assurance on sugar, tobacco, hemp, flax, hides, and skins, they consider themselves free from partial losses, not amounting to *five per cent.*; and that on all other goods, as well as on the ship and freight, if the partial loss be under *three pounds per cent.*, unless it arise from a general average, or the stranding of the ship, the underwriter considers himself discharged.

This memorandum was universally used till the year 1754, when a special jury, agreeable to the direction of Lord Chief Justice Ryder, decided that a ship having run aground was a stranded ship within the meaning of the memorandum; and that, although she got off again, the underwriter was liable to an *average or partial* loss upon damaged corn. In consequence of this decision, the two companies before mentioned, altered the memorandum by striking out the words "*or the ship be stranded;*" so that now they are liable to no losses, which can happen to such commodities, except general averages and total losses: but the old form is still retained by private assurers.—*Cantillon* v. *Lond. Assur. Comp.* 3 Burr. 1553.

There are some kinds of property which do not fall under the general denomination of *goods* in a policy; and for the loss of which the underwriters are not answerable, unless they are specifically named; such as *goods lashed on deck, the captain's clothes, and the ship's provisions.* A policy on *goods* means only such goods as are merchantable, and a part of the cargo; and, therefore, when goods like the present are meant to be assured, they are always assured by name; and the premium is greater.—*Ross* v. *Thwaite;* Sitt. after Hilary, 16 Geo. III.

It is questioned whether a cargo of dollars or other coin, jewels, &c., if lost, be recoverable under a policy upon *goods and merchandises* generally. This point has never been discussed in England: but Magens, in the Treatise on Assurances, p. 10, states explicitly that gold and silver, coined and uncoined, pearls and other jewels, may be assured at London and Hamburg, and several other places, under the general expression of *merchandise.* Magens is confirmed by other writers on the subject: Roccus, Not. 17.

Fifthly. The name of the Place at which the goods are laden, and to which they are bound.

This has been always held to be necessary in policies, and must be so, on account of the evident uncertainty which would follow from a contrary practice, as the assurer would never know

what the risk was which he had undertaken to assure; and, therefore, if a ship be assured from London to a blank being left by the lader of the goods to prevent a surprise by an enemy, and if in her voyage she happen to be cast away, though there be private instructions for her port, yet the assured must sit down with his loss, by reason of the uncertainty.—Molloy, b. 2, c. 7, s. 14.

It is also customary to state in the policy at what port or place the ship may touch and stay during the voyage, so that it shall not be considered as a *deviation* to go to any of those places.

Sixthly. The Time when the Risk commences, and when it ends.

The English policies expressly declare, that "the adventure shall begin upon the said goods and merchandise, *from the loading thereof on board the said ship*, and so shall continue until the said ship, goods, and merchandises, shall be arrived at L.; and upon the said ship till she has moored at anchor twenty-four hours in good safety; and *upon the goods till the same be there safely discharged and landed.* From these words, it is obvious, that the assurers are not answerable for any accident which may happen to the goods in lighters or boats going aboard, *previous* to the voyage; yet, as the policy says, the risk shall continue *till the goods are safely landed*, it seems the assurer continues responsible for the risk to be run in carrying the goods in boats to the shore. If there be a loss, however, in these cases, the accident must have happened while the goods were in the boats or lighters belonging to the ship; but, in a case where the owner of the goods brings down his own lighter, receives the goods out of the ship, and, before they reach land, an accident happens whereby the goods are damaged, the assurer is discharged, although the assurance be upon goods to London, *and till the same be safely landed there.—Sparrow* v. *Carruthers;* 2 Stra. 1236.

In the unloading of goods there should be no unreasonable delay, but this must always depend upon circumstances.

The risk on the body of a ship is generally to commence "from *her beginning to load at* and so shall continue and endure *until the said ship shall arrive at* and hath there been moored at anchor 24 hours in good safety." This mode of stating the commencement of the risk must commonly be supplied to assurances on ships outward bound; for, when assurance is made on the homeward risk, the beginning of the adventure is sometimes stated to be "immediately from and after her arrival at the port abroad;" at other times, from the

departure; and, in short, it is very variable, depending upon the inclination of the assurer.—1 Magens, 47.

Seventhly. Of the various Perils and Risks against which the Underwriter assures.

The words now used, expressive of the assurer's risks are very extensive, including "all perils of the seas, men of war, fire, enemies, pirates, rovers, *thieves*, jettisons, letters of mart, and countermart, surprisals, takings at sea, arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality, soever; barratry of the master or mariners, and all other perils, losses, and misfortunes, that have or shall have come to the hurt, detriment, or damage of the said goods and merchandises, and ship, or any part thereof."

The law of England is totally silent as to the description of *thieves* meant by the policy; whether the assurer undertakes as well against thefts committed by the master or mariners, as against thefts committed from without. That he is liable in the latter case cannot be doubted: *Harford* v. *Maynard;* sittings at Guildhall, Hilary vacation, 1785, and Molloy, b. 2, c. 7, § 5; but foreign writers assert that he is not liable for the former. Roccus, not. 42.

In addition to these, it is frequently the practice to assure her *lost or not lost*, in which, if the ship should be lost at the time of the assurance, still the underwriter, provided there be no fraud, is liable. The practice is peculiar to English policies, not being adopted by foreign nations.

Eighthly. The Consideration or Premium for the Risk or Hazard run.

This is always expressed to have been received at the time of underwriting; "we, the assurers, confessing ourselves paid the consideration due unto us for this assurance by the assured." This being subscribed by the underwriter, it is proper to inquire whether, if the premium were not actually paid at the time, he could afterwards maintain an action for it against the *assured*, who might then produce his subscription as evidence against himself. Questions upon policies of assurance stand most broadly upon the usage of the place where the policy is effected, and this question would, no doubt, be determined by usage. By the custom of London, the underwriter credits the broker, and not the assured, for the premium; and therefore the underwriter cannot demand it of the assured, but the broker as certainly could.—*Airy and others*, assignees of Milton, v. *Bland;* sittings at Guildhall, 14 Geo. III.

The premium of consideration paid, given, or contracted for, *must*, like the risk, be inserted, by 35 Geo. III., c. 63, § 11.

Ninthly. The Day, Month, and Year, on which the Policy is executed.

This insertion seems very necessary, because, by computing the date of the policy with the date of facts which happened afterwards, or are material to be proved, it will frequently appear whether there is any reason to suspect fraud or improper conduct on the part of the assured.

II.—*The Construction of the Policy.*

In the construction of policies, two rules chiefly prevail, namely, to give effect to the *intentions* of the parties, and to the *usage of trade*, with respect to the particular voyages or risks to which the policy relates.

In a case so early as in the time of James the second, a policy of assurance was construed to run until the ship had ended and was discharged of her voyage; for arrival at the port to which she was bound was not a discharge, *till she was unloaded.*

But, although this construction be right, where the policy is general from A. to B. yet if it contains the words usually inserted—"*and till the ship shall have moored at anchor twenty-four hours in good safety*," the underwriter is not liable for any loss arising from seizure after she has been twenty-four hours in port, even if such seizure was in consequence of an act of barratry (such as *smuggling*) of the master *during the voyage. Lockyer and others* v. *Offley*, 1 Term Rep. p. 252.

The ship Success was assured "*at and from Leghorn to the port of London, and till there moored twenty-four hours in good safety.*" She arrived the 8th of July at Fresh Wharf, and moored, but was the same day served with an order to go back to the Hope, to perform a fourteen day's quarantine. The men upon this deserted her; and on the 12th of the month the captain applied to be excused going back, which petition was adjourned to the 28th, when the regency ordered her back; and on the 30th she went back, performed the quarantine, and then sent up for orders to air the goods; but, before she returned, the ship was burnt, on the 23d of August; and the question was, whether the assurer was liable; Lord Chief Justice Lee ruled, that though the ship was so long at her moorings, yet it could not be said to be there in *good safety*, which must mean the *opportunity* of unloading and discharging. *Waples* v. *Eames*, 2 Stra. 1243.

So where the ship Hercules was assured from Bilbao to Rouen, *and till twenty-four hours moored in safety there*, the ship arrived, an embargo having been *previously* laid on all En-

glish vessels in that port. The captain went on shore the day after his arrival, and the embargo was laid on his ship the next day. He was afterwards permitted to land the cargo, which he delivered to consignees, but the ship was *detained as a prize.* Lord Kenyon ruled that, she was as much within the power of the enemy as if a guard had been put on board the moment she arrived: she could not be said to be twenty-four hours, or a minute, moored in safety, so far as relates to these plaintiffs; for, immediately on entering the port, she was to all intents and purposes captured by the French. *Minett* v. *Anderson*, Peak's Rep. Sittings after Hil. 34 Geo. III.

But where a ship had arrived at the wharf on the 12th of January, and was laid on the outside of the tier, there being no room to lay her on the inside; where the sails were unbent, topmasts struck, three anchors out, and she was also lashed to another ship, and so continued till the 19th, when several ships and a quantity of ice forced her adrift, and she was wholly lost; Lord Kenyon was of opinon she was completely moored on the 19th; and, as the accident did not happen till above twenty-four hours after that time, the underwriters were not liable.—*Angerstin* v. *Bell.* Sittings at Guildhall after Trinity, 1795.

Upon an assurance from London to the East Indies, *warranted to depart with convoy*, the facts were, that the ship went from London to the Downs, and thence with convoy, and was lost. It was adjudged that, the clause "warranted to depart with convoy," must be construed according to the *usage* among merchants, that is, from such place where convoys are to be had, *as the Downs;* and that therefore, in this case, there was not a departure without convoy. *Lethulier's case*, 2 Salk. 443.

So, likewise, on an assurance from Bremen to the port of London, *warranted to depart with convoy.* The case was, the ship set sail from Bremen under the conduct of a Dutch man of war to the Elbe, where they were joined by two other Dutch men of war and several Dutch and English merchant ships, whence they sailed to the Texel, where they found a squadron of English men of war and an admiral. After a stay of nine weeks, they set sail from the Texel: the ship was separated in a storm, taken by a French privateer, and retaken by a Dutch privateer, and paid eighty pounds salvage. It was ruled by Lord Chief Justice Holt, that the voyage ought to be according to *usage;* that their going to the Elbe, though out of the way, was no deviation; for, till after the year 1703, (prior to which time this policy was made,) there was no convoy for ships directly from Bremen to London. *Bond* v. *Gonsales*, 2 Salk. 445.

In an assurance upon *freight*, if an accident happens to the ship *before any goods* are put on board, which prevents her from sailing, the assured upon the policy cannot recover the freight which he would have earned if she had sailed. *Tonge* v. *Watts*, 2 Stra. 1251.

But, if the policy be a *valued* policy, and *part* of the cargo be on board when such accident happens, the rest being ready to be shipped, the assured may recover to the whole amount. *Montgomery* v. *Egginson*, 3 Term Rep. 362.

So likewise, in an *open* policy on freight, *at and from London and Teneriffe to any of the West India Islands* (*Jamaica excepted.*) The ship was under a charter party to depart out of the River Thames, and proceed to Teneriffe, there to receive on board 500 pipes of wine, to be delivered in the West Indies, for the freight of which the freighters covenanted to pay 35*s.* per pipe. She sailed from London in ballast, and was captured before arrival at Teneriffe. The court held, that the instant the ship departed from the Thames, the contract for freight had its *commencement*, and the plaintiff was entitled to recover. That this case was different from *Tonge* v. *Watts*, where there was *no* commencement of the contract, because no goods had been shipped; and resembled the case of *Montgomery* v. *Egginson*, inasmuch as, though different in their circumstances, in both there was a *commencement* of the contract. *Thompson* v. *Taylor*, 6 Term Rep. 478.

If a charter party of affreightment provides that a reasonable deduction, according to the judgment of certain persons, shall be made from the freight, in case of the "inability of the ship to execute or proceed on the service;" if the ship be unable to proceed from want of men to navigate her, the freight is still liable to the same abatement, although such scarcity of hands should proceed from the small pox, mortality, or desertion.— *Beatson* v. *Schank*; Term Rep. 43 Geo. III., Hilary.

On an assurance from London to Gibraltar, *warranted to depart with convoy*, it appeared there was a convoy appointed for that trade at Spithead, and the ship assured, having tried for convoy in the Downs, proceeded for Spithead, and was taken in her way thither. Lord Chief Justice Lee was of opinion, that the ship was to be considered as under the defendant's assurance to a place of general rendezvous, according to the interpretation of the words, *warranted to depart with convoy*: and, if the parties meant to vary the assurance from what is *commonly* understood, they would have stated it in the policy. 2 Stra. 1265.

The ship Eyles, late in the East India Company's service, was in the year 1732, at Bengal, at which time the owner employed his agents to assure the ship in London for five hundred

pounds. The adventure thereon was to commence *from her arrival at Fort St. George*, and thence to continue till the said ship should arrive in London; and that it should be lawful for the said ship, in the said voyage, to stay at any ports or places without prejudice, and that the ship was and should be rated at *interest or no interest*, without further account. The Eyles came to Fort St. George in February, 1733, in her way to England; but, being leaky, and in a very bad condition, upon the unanimous advice of the governor, council, commanders of ships, &c., she sailed for Bengal to be refitted, and, after being sheathed, in her return upon her homeward bound voyage, she struck upon the English sands and was lost.—Upon this case, it was said by Lord Chancellor Hardwicke —Stress of weather, and the danger of proceeding on a voyage, when a ship is in a decayed condition, are to be considered; for, in such a case, if she went to the nearest place, I should consider it equally the same as if she had been rapaired at the place from which the voyage was to commence, according to the terms of the policy, and no deviation. There is here no proof why she might not have been equally well repaired at Fort St. George; but there is one part of this case which distinguishes it from all others whatever, and that is, as to the certain time the voyage was to commence. The fact is, the ship was lost in July, 1733, three weeks before the time of making this policy, so that clearly the ship was not at Fort St. George at the time the agreement was made; and therefore it is a material question whether it comes within the agreement. His lordship directed an issue to try, whether the loss in July, 1733, was a loss during the voyage, and according to the adventure agreed upon: and, upon the trial of that issue, the underwriter was holden liable.—*Motteux and others* v. *London Assur.* 1 Atk. 545.

The words "*at and from Bengal to England*," mean the *first arrival* at Bengal; and, when such words are used in policies, *first arrival* is always implied and understood. 1 Atk. 548.

When a ship is assured *at and from a place*, and it arrives at that place, as long as the ship is preparing for the voyage upon which it is assured, the assurer is liable: but, if all thoughts of the voyage be laid aside, and the ship lie there five, six, or seven years, with the *owner's* privity, the assurer is not liable. *Chitty* v. *Selwin*; 2 Atk. 359.

A ship was assured *at and from Jamaica to London*; she had also been assured from London to Jamaica generally, and was lost in coasting the island, after she had touched for some days at one port there, but before she had delivered all her outward bound cargo at the other ports of the island. The question was, when the homeward bound risk commenced, and at what time the outward bound risk determined? A special jury, after an

examination of merchants as to the custom, decided, that the outward risk ended when the ship had moored in *any* port of the island, and did not *continue* till she came to the last port of delivery.—*Camden* v. *Cowley;* 1 Blackst. 417.

This was afterwards confirmed by Lord Mansfield, who laid down this doctrine, that the outward risk *upon the ship* ended twenty-four hours after its arrival in the first port in the island to which it was destined; but that the outward policy *upon goods* continues till they were landed.—*Barras* v. *London Assur.;* Sittings after Hilary, 1782.

And the law of the two last cases has been since corroborated by the decision of a cause before Lord Kenyon; (*Leigh* v. *Mather*, Sittings after Mich., 1795;) in which it was determined, that, the risk on the ship *ceased* after she had moored twenty-four hours in the first port of the island, for the purpose of unloading; and that a ship assured generally to any island, cannot be permitted to go round the whole island for the purpose of unloading her cargo.

But the most important cases upon questions of construction are the two following; in which the principles are laid down with so much accuracy and precision, that we detail them rather at length.

An action was brought upon a policy of assurance "on goods in a Dutch ship, from Malaga to Gibraltar, *and at and from thence* to England and Holland, both or either: on goods, as hereafter agreed, beginning the adventure from the loading, and to continue till the ship and goods be arrived in England or Holland, and there safely landed." The agreement was, "that, upon the arrival of the ship at Gibraltar, the goods might be unloaded and reshipped in one or more British ship or ships for England and Holland, and to return one *per cent.* if discharged in England." It appeared in evidence, that, when the ship came to Gibraltar, the goods were unloaded, and put into a *store ship*, (which, it was proved, was always considered as a warehouse,) and that there was then no British ship there. Two days after the goods were put into the store ship, they were lost in a storm.

Lee, Chief Justice.—Policies are to be construed largely, for the benefit of trade and for the assured. Now, it seems to be a strict construction, to confine this assurance only to the unloading and reshipping, and the accidents attending this act. The construction should be according to the course of trade in this place; and this appears to be the usual mode of unloading and reshipping in that place, viz. that when there is no British ship there, then the goods are kept in store ships. Where there is an assurance on goods on board such a ship, that assurance extends to the carrying the goods to shore in a boat. So,

if an assurance be of goods to such a city, and the goods are brought in safety to such a port, though distant from the city, that is a compliance with the policy, if that be the usual place to which the ships come. Therefore, as here is a liberty given of unloading and reshipping, it must be taken to be an assuring under such methods as are proper for unloading and reshipping. There is no neglect on the part of the assured, for the goods were brought into port the 19th, and were lost the 22d of November. This manner of unloading and reshipping is to be considered as the necessary means of attaining that which was intended by the policy; and seems to be the same as if it happened in the act of unshipping from one ship to another. And as this is the known course of the trade, it seems extraordinary if it were not intended. This is not to be considered as a suspension of the policy: for, as the policy would extend to a loss happening in the unloading and reshipping from one ship to another, so any means to attain that end come within the meaning of the policy. The plaintiff had a verdict.—*Tierney* v. *Etherington;* 1 Barr. 348.

In an action upon a policy of assurance, the following case was stated for the opinion of the court. "The plaintiff being part owner of the ship Onslow, an East India ship, then lying in the Thames, and bound on a voyage to China, and back again to London, assured it *at and from London to any port or place beyond the Cape of Good Hope, and back to London, free from average under ten* per cent. *upon the body, tackle, apparel, ordnance, ammunition, artillery, boat, and other furniture, of and in the said ship: beginning the adventure upon the said ship from and immediately following the date of the policy, and so to continue and endure until the ship shall be arrived as above, and there anchored twenty-four hours in good safety.* The perils mentioned in the policy were the common perils, viz., *of the seas, men of war, fire, &c.* The ship arrived in the river of Canton, in China, where she was to stay to clean and refit, and for other purposes. Upon her arrival there, the sails, yards, tackle, cables, rigging, apparel, and other furniture, were, by the captain's order, taken out of her, and put into a warehouse, or storehouse, called a bank-saul, built for that purpose on a sand bank, or small island lying in the said river, near one of the banks, called Bank-saul Island, in order to be there repaired, kept dry, and preserved, till the ship should be heeled, cleaned, and refitted. Some time after this, a fire broke out in the bank-saul belonging to a Swedish ship, and communicated itself to another bank-saul, and thence to that belonging to the Onslow, and consumed the same, together with all the sails, yards, &c., belonging to the Onslow, that were therein. It was the *universal and well-known* usage, and has been for a great number of

years, for all European ships, which go on a China voyage, except Dutch ships, (who for some years past have been denied this privilege by the Chinese, and who look upon such a denial as a great loss) when they arrive near this Bank-saul Island, in the river of Canton, to unrig ships, and to take out their sails, yards, tackles, cables, rigging, apparel, and other furniture, and to put them on shore on a bank-saul, built for that purpose on the said island, (in the manner that had been done by the captain of the Onslow on the present occasion) in order to be repaired, kept dry, and preserved, until the ship should be heeled, cleaned, and refitted. The ship arrived from her said voyage in the Thames, having been again rigged, and put in the best condition the nature of the place and circumstances of affairs would permit. The question for the opinion of the court was, whether the assurers are liable to answer for this loss, so happening upon the bank-saul, within the intent and meaning of this policy."

The following unanimous opinion of the court was delivered by Lord Mansfield:—"By the express words of the policy, the defendants have assured the tackle, apparel, and other furniture, of the Onslow, from *fire*, during the whole time of her voyage, until her return in safety to London, without any restriction. Her tackle, apparel, and furniture, were inevitably burnt in China, during the voyage, before her return to London. The event, then, which has happened, is a loss within the general words of the policy; and it is incumbent upon the defendants to show, from the manner in which this misfortune happened, or from other circumstances, that it ought to be construed a peril which they did not undertake to bear. If the chance be varied, or the voyage altered, by the fault of the owner or master of the ship, the assurer ceases to be liable; because he is only understood to engage that the thing shall be done safe for fortuitous dangers, provided due means are used by the trader to attain that end. But the master is not in fault, if what he did was done in the usual course and just reasons. The assurer, in estimating the price at which he is willing to indemnify the assured against all risks, must have under his consideration the nature of the voyage to be performed, and the usual course and manner of doing it. Every thing done in the usual course must have been foreseen and in contemplation at the time he engaged: he took the risk, upon a supposition, that what was usual or necessary should be done. In general, what is usually done by such a ship, with such a cargo, in such a voyage, is understood to be referred to by every policy, and to make a part of it, as much as if it were expressed. The usage, when foreseen, is rather allowed to be done, than what is left to the master's discretion, upon unforeseen events: yet, if the master, *ex justa causa*, go out of the way, the assurance

continues. Upon these principles it is difficult to frame a question, which can arise out of this case, as stated. The only objection is, that they were burnt in a bank-saul, and not in the ship; upon land, not at sea, or upon water; and, being appertinent to the ship, losses and dangers ashore could not be included. The answer is obvious: first, the words make no such distinction; secondly, the intent makes no such distinction. Many accidents might happen at land, even to the ship. Suppose a hurricane to drive it a mile on shore; or, an earthquake might have a like effect; suppose a ship to be burnt in a dry dock: or, suppose accidents to happen to her tackle upon land, taken from the ship, while accidentally and occasionally refitting, as on account of a hole in its bottom, or other mischance; these are all possible cases. But what might arise from an accidental repair of the ship is not near so strong, as a certain necessary consequence of the ordinary voyage, which the parties could not but have in their direct and immediate contemplation. Here the defendants knew that the ship must be heeled, cleaned, and refitted, in the river of Canton; they knew that the tackle would then be put in the bank-saul; they knew it was for the safety of the ship, and prudent that they should be put there. Had it been an accidental necessity of refitting, the master might have justified taking them out of the ship *ex causa justa;* but describing the voyage is an express reference to the usual manner of making it, as much as if every circumstance were mentioned. Was the chance varied by the fault of the master? It is impossible to impute any fault to him. Is this like a deviation? No, it is *ex justa causa*, which always excuses. Had the assurers been asked whether the tackle should be put in the bank-saul, they must, for their own sakes, have insisted that it should. They would have reason to complain, if, from their not being put there, a misfortune had happened. In such a case the master would have been to blame, and, by his fault, would have varied the chance. They have taken a price for standing in the plaintiff's place, as to any losses he might sustain in performing the several parts of the voyage, of which this was known and intended to be one. Therefore, we are all of opinion, that, in every light, and in every view, of this case, in reason and justice, and within the words, intent, and meaning, of this policy, and within the view and contemplation of the parties to the contract, the assurers are liable to answer to this loss."—*Pelly* v. *Royal Exch. Assur.* 1 Burr. 341. This case has been since confirmed by the Court of King's Bench.—4 Term Rep. 206.

The same principles were adhered to in a more modern case. The assurance was upon the ships the Hope and the Anne, *at and from* Dartmouth to Waterford, and thence to the port or

ports of discharge, on the coast of Labrador, with leave to touch at Newfoundland, and upon any kind of goods and merchandises; and also on the ships, till they should be arrived at their port of discharge, and should have moored at anchor *twenty-four hours, and on the goods until the same be there discharged and safely landed.* By a clause in the policy, money advanced to the fishermen was assured. The Anne arrived safe on the coast of Labrador, on the 22d of June, and the Hope on the 14th of July, 1778. From the time of their arrival the crews were employed in fishing, and had taken out none of their cargoes, except at leisure hours, (partly on Sundays,) such things as were immediately wanted. On the 13th of August, an American privateer entered the harbour and took both the vessels, there being at that time nobody on board either of them. The question was, whether there had not been an unnecessary delay in unloading the cargoes, in consequence of which they had been exposed to capture, and whether the underwriters ought to be liable for what had happened from this negligence of the assured? It was proved that, in the Newfoundland trade, it is customary to keep their goods on board several months, and that sometimes they have part of their homeward cargo of fish and part of the old cargo on board at the same time. That the first object is to catch fish, and they unload only at times when they cannot fish. The old cargo being chiefly salt and provisions, it is taken out gradually for curing the fish, and for consumption. That it was usual in chartering vessels in this trade, to stipulate that they should have sixty days allowed for discharging. That they were oftentimes longer, in fact, and that it was not so easy to discharge a cargo at Labrador as at Newfoundland. Upon this evidence a verdict was found, by which the underwriters were holden to be liable—*Noble and others* v. *Kennoway*, Doug. 492.

These decisions, notwithstanding the vast variety of their circumstances, are uniform in principle, and the judges always make a constant reference to the *usage of trade.*

This is confirmed by the cases of assurance upon *East India voyages*, in which the assurers have been held liable, not only for events which may possibly happen from the port of discharge to that of delivery, but also *for all intermediate or country voyages*, and upon which the ship may be despatched by order of the council of any of the East India Company's settlements abroad. And this construction of East India policies prevails, whether the words of them be large and comprehensive, such as *with liberty to touch, stay, and trade, at any port or places whatsoever*, or restrained and limited, such as *to touch and stay at any port or place in this voyage.*—*Salvador* v. *Hopkins*, 3 Burr. 1707.—*Gregory* v. *Christie*, Trin. Term, 24 Geo.

III. *Farquharson* v. *Hunter*, Hilary, 25 Geo. III. At the same time, though the general rule be so, yet the parties contracting may, by their own agreement, prevent such a latitude of construction. In order to do this, it is not necessary that the express words of exclusion should be inserted in the policy ; but if, from the terms used, the court can collect, that such was the intention of the parties, that construction, which is most agreeable to their intention, will prevail. *Lavabre* v. *Wilson*, 2 Doug. 27.

When an assurance is made on one species of property, the damage sustained by a loss of property, different from that named in the policy, cannot be recovered. Thus a man who has assured a cargo of *goods*, cannot recover the *freight* which he has paid for the carriage of that cargo : nor can an owner, who assures the *ship merely*, demand satisfaction for the loss of *merchandise* laden thereon, or ask from the assurers *extraordinary wages paid to the seamen, or the value of provisions consumed*, by reason of the detention of the *ship* at any port longer than was expected. *Fletcher and others* v. *Poole*, Sittings after Easter, 1769. *Baillie* v. *Modigliani*, Hilary Term, 25 Geo. III.

On a policy on a *ship*, sailors' wages or provisions are never allowed in settling the damages; for, if a ship is detained, in consequence of any injury received in a storm, though the underwriter must make good that damage, yet the assured cannot come upon him for the amount of wages or provisions during the time she was repairing. *Robertson* v. *Ewer*, 3 Term Rep. 127.

But, on a policy on a ship and *furniture*, where the *provisions for the* crew were burnt, it was determined that *provisions for the crew* are comprehended under *furniture*, and that the underwriter was of course answerable for their loss. *Brough* v. *Whitmore*, 4 Term Rep. 206.

In an assurance upon a Greenland ship, the value of *lines and tackle*, employed in the fishery, is not recoverable under a policy made upon the *ship*, *tackle*, *and furniture*, &c. *Hoskins* v. *Pickersgill*, King's Bench, Easter, 23 Geo. III.

In order to intitle the assured to recover, the loss must be a direct and immediate consequence of the peril assured, and not a remote one. This doctrine was laid down in the following case:

It was an action on the policy of assurance, "at and from Bristol to the coast of Africa, during her stay and trade, and thence to our port or ports of discharge in the West Indies." There was a memorandum on the policy, that "the assurers are not to pay any loss that may happen in boats during the voyage, (mortality by natural death excepted,) and not to pay for mortality by mutiny, unless the same amount to 10*l.* *per cent.* to be

computed on the first cost of the ship, outfit, and cargo, valuing negroes so lost at 35*l.* per head." The demand upon the policy was the loss of a great many slaves by mutiny: 225 prime slaves were shipped on board: on the 3d of May, before the ship sailed from Africa, an insurrection was attempted; the women seized the captain, and endeavoured to throw him overboard, but he was rescued by the crew; the women and some men threw themselves down the hatchway, and were much bruised. He sent the ringleader on shore; and twelve men and a woman afterwards died of those bruises, and from abstinence. On the 22d of May, there was a general insurrection, the crew were forced to fire upon the slaves, and attack them with weapons, it being a case of imminent necessity. Several slaves took to the ship's sides, and hung down in the water by the chains and ropes, some for about a quarter of an hour; three were killed by firing, and three were drowned; the rest were taken in, but they were too far gone to be recovered; many of them were desperately bruised, many died in consequence of the wounds they had received from the firing during the mutiny some from swallowing salt water, some from chagrin at their disappointment and from abstinence: several from fluxes and fevers: in all, to the amount of 53. The underwriter had paid at the rate of 15*l. per cent.* for 19 who were either killed during the mutiny, or had afterwards died of their wounds. *Another consequential damage was stated, that the mutiny had lessened the remaining slaves in the estimation of the planters, and reduced their price.* Lord Mansfield said, as to the latter loss, I think the underwriter is not answerable for the loss of the market, or the price of it; that is a remote consequence, and not within any peril assured against by the policy. The jury determined, that all who were killed in the mutiny or died of their wounds were to be paid for. That all those who died of their bruises, which they received in the mutiny, though accompanied with other causes, were to be paid for. That all who had swallowed salt water, and died in consequence thereof, or who leaped into the sea, and hung upon the sides of the ship, without being otherwise bruised, or who died of chagrin, were not to be paid for:—*Jones* v. *Schmoll*, 1 Term Rep. p. 130. This case, however, is not to be received as a general precedent affecting future assurances on African voyages; since by the acts of parliament for regulating the slave trade, such losses as those which occurred in this case are not assurable. To the honour of our country, this infamous trade has ceased. See hereafter.

In the construction of policies for *time*,* the same liberality

* By 35 Geo. III., c. 63, § 12, no policy upon any ship or interest therein can be made for a longer term than twelve calendar months.

prevails; thus, in a policy of assurance of the ship Mary, letter of marque, the words were, "at and from Liverpool to Antigua, *with liberty to cruize six weeks*, and return to Ireland, or Falmouth, or Milford, with any prize or prizes." The ship having been taken, an action was brought, when a verdict was found for the plaintiffs. The material parts of the evidence were, that the policy was made on the 9th of February, 1779, and there was no time fixed in it for the the commencement or the duration of the voyage. The captain of the ship swore, that he sailed from Liverpool on the 28th of February; he was five days before he cleared the land; and he proceeded on his direct voyage till the 14th of March, chasing, however, at different times, from the 7th to the 14th; at which time he began his cruise, giving notice thereof to the crew, ordering a minute of it to be entered in the logbook, which was done. From the 14th of March, he continued cruising about the same latitude till the 17th or 18th of April, when he discontinued the cruise, of which he also gave notice, intending to go to the Berlings off Lisbon, in the course of his voyage. On the 23d he renewed the cruise, of which he gave notice, as before, and ordered a minute to that purpose to be entered in the log-book.—From that time he continued cruising till the 28th of April, when he was taken by an American privateer. Many witnesses were examined, some of whom thought, that the liberty of cruising, given by the policy, meant six successive weeks; others conceived, that, if the separate times of cruising, when added together, should not exceed the space of six weeks, the terms of the assurances would be complied with; but none of them could prove any usage, as none of the witnesses ever knew a case exactly circumstanced like the present.

A motion was made for a new trial; upon which Lord Mansfield said,—"Here the subject matter, in my opinion, is sufficient to show that the six weeks meant one continued period of time. A cruise is a well known expression for a connected portion of time. There are frequently articles for a month's cruise, a six weeks cruise, &c. Such a liberty as in this case, to a letter of marque, is an excuse for a deviation; for the true meaning is, I will excuse a deviation for six weeks. If they had meant separate days, they would have said forty-two days." The court ordered a new trial. *Syers and others* v. *Bridge*; Dougl. 509.

Thus, it appears that, the material rules to be adhered to, in the construction of policies, are, *the intention of the parties* entering into the contract, and *the usage of trade*.

III. *Perils of the Sea.*

It may, in general, be said, that every thing happening to a ship, in the course of her voyage, by the intermediate act of

God, without the intervention of human agency, is a peril of the sea. Thus every accident happening by the violence of the wind and waves, by thunder or lightning, by driving against rocks, by the stranding of the ship, or by any other violence which human prudence could not foresee, nor human strength resist, may be considered as a loss within the meaning of such a policy; and the assurer must answer for all damages sustained, in consequence of such accident. But, if a ship be driven by stress of weather on an enemy's coast, and is there captured, it is a loss by capture, and not by perils of the seas. *Green* v. *Elmsley;* Peak, 212.

In order to charge the underwriter for a loss by perils of the sea, the ship must be equipped with every thing necessary for the voyage; she must be sea-worthy, have a sufficient crew, and a captain and pilot of competent skill. And, therefore, when a ship, homeward bound from Stettin to London, received on board a pilot from Orfordness, but dropped him at Half-way Reach in the river Thames before she had reached her moorings higher up in the river, and an accident afterwards happening by which the ship was lost, the underwriter on the ship and cargo was holden discharged from his liability, on account of there not being any pilot on board at that time, although it did not appear that the loss was directly imputable to the want of skill in those that navigated her. *Law* v. *Hollingsworth;* 7 Term Rep. 160.

In the case of *Rohl* v. *Parr*, the ship had been destroyed by a species of worms which infest the rivers in Africa; and an intelligent merchant swore that he had known many instances of this species of loss, but that the underwriters had invariably refused to pay. Lord Kenyon and the jury, upon this evidence, decided that it was not a loss by *perils of the sea.* Sittings of Hilary, 1796.

If a ship has been missing, and no intelligence received of her within reasonable time after she sailed, it shall be presumed that she foundered at sea. *Newby* v. *Read;* Sittings after Mich., 3 Geo. III.

And even in an action on a policy, in which there was a warranty *against captures and seizures*, (the ship never having been heard of after sailing,) it was insisted, for the defendant, that as captures and seizures were excepted, it lay upon the plaintiff to prove, that the loss happened in the particular manner stated. Lord Chief Justice Lee, said, it would be unreasonable to expect certain evidence of such a loss, where every body on board is presumed to be drowned; and all that can be required is, the best proof the nature of the case admits of, which the plaintiff has given. The jury found a verdict for the plaintiff. *Green* v. *Brown;* 2 Stra. 1190.

A practice prevails among assurers, that the ship shall

be deemed lost if not heard of in six months after her departure, (or after the time of the last intelligence from her,) for any port in Europe, and in twelve months, if for a greater distance. If, under this usage, the assurer should pay the money, supposing the ship lost, when it really is not, he may, as we shall see hereafter, recover it back in action.

IV. *Capture and detention by Princes; or Foreign Powers.*

A ship is to be considered as lost by *capture*, though she be never condemned at all, nor carried into any port or fleet of the enemy, and the assurer must pay the value. If, after a condemnation, the owner recover or retake her, the assurer can be in no other condition than if she had been retaken or recovered before condemnation. The assurer runs the risk of the assured, and undertakes to indemnify; he must therefore bear the *loss actually* sustained. So that, if, after condemnation, the owner recovers the ship in her complete condition, but has paid for salvage, or been at any expense in getting her back, the assurer must pay the loss so actually sustained. No capture by the enemy can be so total a loss as to leave no possibility of recovery. If the owner himself should retake, at any time, he will be intitled: and, by the acts of 29 Geo. II., c. 34, § 24, and 33 Geo. III., c. 66, § 42, if an English ship retake the vessel captured, either before or after condemnation, the owner is entitled to restitution upon stated salvage. The chance does not, however, suspend the demand for a total loss upon the assurer; but, in case of a recapture, justice is done, by putting him in the place of the assured. *Goss* v. *Whithers;* 2 Bur. 694.

Where a capture has been made, whether it be legal or not, the assurers are liable for the charges of a *compromise* made, *bona fide*, to prevent the ship from being condemned as prize, or to avoid the greater expense of prosecuting an appeal. *Berens* v. *Rucker;* 1 Blackst. 313.

But as, by 32 Geo. III., c. 25, and 33 Geo. III., c. 66, all *ransoms* of British ships captured are declared illegal, no sums paid on *such* account can be recovered from the underwriters.

Upon this principle the following case was decided: The ship Themis was assured for twelve months; during which period she was captured, carried into Bergen, in Norway, and there condemned by the French consul. After sentence, she was put up for sale there, and repurchased by the agent of the plaintiff: and this repurchase money the plaintiff insisted he had a right to recover. The court, after two arguments, were unanimously of opinion, "that, as the sentence of a French consul in a neutral country was contrary to the law of nations, and void, the property was never divested out of the original owner:

and therefore the money paid for the repurchase was in *the nature of a ransom.* The ransom acts are remedial laws; and, in the construction of such acts, it is a rule to *extend* the remedy so as to meet the mischief. The legislature meant to prevent such a transaction as the present, because it would take away the chance of a recapture. This transaction being done *by an agent*, at an *auction*, and *on* land, was immaterial, as the acts of parliament had not described in what places, or in what form, a ransom is prohibited." *Havelock* v. *Rockwood;* 8 Term Rep. 268.

In cases of capture, the underwriter is *immediately* responsible to the assured. But, if the ship be recovered before a demand for indemnity, the assurer is only liable for the amount of the loss actually sustained at the time of the demand: or, if the ship be restored at any time subsequent to the payment by the underwriter, he shall then stand in the place of the assured, and receive all the benefits and advantages resulting from such restitution. All these regulations have their foundation in this great principle, that a policy of assurance is nothing more than a contract of indemnity.

If an assurer underwrite property belonging to another country between which and our own hostilities break out, subsequent to the policy being effected, which said property is captured, lost, or destroyed, during the war, the underwriter is not liable.—*Gamba and another* v. *Le Mesurier;* Term Rep. Mich., 44 Geo. III.; and *Brandon* v. *Curling*.

The underwriter is likewise answerable for all loss or damage arising to the assured, "*by the arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality soever.*"

The only question then is, what shall be considered as such detention? Lord Mansfield has said, that the assured may abandon in case merely of an arrest or embargo by a prince, not an enemy; and, consequently, such an arrest is also within the meaning of the word *detention.*—2 Burr. 696.

An embargo is an *arrest* laid on ships or merchandise by public authority, or a prohibition of state commonly issued to prevent foreign ships from putting to sea in time of war, and sometimes also to exclude them from entering our ports. Ships are frequently detained to serve a prince in an expedition, and for this end have their loading taken out, without any regard to the colours they bear, or the princes to whose subjects they belong: And this is an arrest within the meaning of the policy.

In case of a detention by a foreign power, which in time of war may have seized a neutral vessel at sea, and carried it into port to be searched for enemy's property, all the charges consequent thereon must be borne by the underwriter; and whatever

costs may arise from an improper detention, must always fall upon them.—*Saloucci* v. *Johnson*; Hill. 25 Geo. III.

The trustees of the Crown, if a ship that is captured be lost before condemnation, are entitled to recover against the assurers.—*Craufurd* v. *Hunter*; 8 Term Rep. 25.

The South Carolina, an American ship, of Charlestown, bound for London, was assured by the defendant. On her return, she was captured by a French privateer, and carried into L'Orient. Being afterwards condemned on account of her not being provided with a list of the crew, according to the French ordinances and regulations, the defendant refused to pay the loss. But, as she was furnished with all the papers an American ship ought to have, the plaintiffs obtained a verdict.—*Price and another* v. *Bell*; Term Rep. Trinity, 41 Geo. III.

In the following case, the plaintiff obtained a verdict on the principle "that the condemnation of any vessel by a foreign court of admiralty is conclusive only here as to the *express ground* of the sentence." The policy of the American ship Mercury was subscribed by the defendant as an underwriter for 200*l*. On her passage from Virginia to Bremen, she was captured by a French privateer, and carried into Nantes, where she was condemned by a French court of admiralty, "as belonging to the enemies of the French Republic." But, as the ship was provided with all the proper and usual documents, it was held that the underwriters were responsible.—*Christie* v. *Secretan*; 8 Term Rep. 192.

But, though an underwriter is liable for all damages arising to the owner of the ship or goods from the restraint or detention of princes, yet that rule is not extended to cases where the assured navigates against the laws of those countries, in the ports of which he may chance to be detained, or to cases where there shall be a seizure for non-payment of customs.—2 Vern. 176.

If indeed any of those acts were committed by the master of the ship, without the knowledge of the assured, the underwriter would be liable, not for losses by *detention*, but for a loss by the barratry of the master.

Since the case of *Robertson* v. *Ewer*, mentioned before, there seems to be very little doubt, that an underwriter is liable to pay damage arising by the detention or seizure of ships by the government of the country to which they belong; for, an embargo had been laid by Lord Hood on all shipping at Barbadoes; and it was never doubted that the assurer was liable for any loss which might have been sustained by such detention, provided the loss had happened to any of the property specifically assured. If the ship be detained by the order of the state before her departure for the voyage, but *after the risk* com-

menced, the assurer, by our law, is liable for the damage occasioned by such detention, as the words of the policy do in themselves import no restrictions as to restraints and embargoes by foreign potentates only.—*Rotch* v. *Edie;* 6 Term Rep. 413.

Although the words of this part of the policy are, "*arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality soever;*" yet the word *people* must be understood as applying to *those people who are the ruling power of the country*, and not to any assemblage or people who arrest the ship in a violent or riotous manner.—*Nesbit* v. *Lushington;* 4 Term Rep. 783.

Before the assured can recover against the underwriter in cases of detention, he must first *abandon* to the assurers his right, and whatever claims he may have to the goods assured. This point will be treated under the head of Abandonment.

V. *Barratry of the Master or Mariners.*

Barratry is committed when the master of the ship or the mariners cheat the owners or assurers, whether it be by running away with the ship, sinking her, deserting her, embezzling the cargo, or by carrying a ship a different course from their orders.—Postlethwaite's Dict. 1 vol. p. 136. 214. These definitions are so very comprehensive, that they seem to take in every case of barratry, known to the law of England. From a review of the decisions on this subject, it appears, that any act of the master, or of the mariners, which is of a criminal nature, or which is grossly negligent, tending to their own benefit, to the prejudice of the owners of the ship, *without their consent or privity*, is barratry.

It is not necessary, in order to entitle the assured to recover for barratry, that the loss should happen *in the act of barratry;* that is, immaterial whether it take place *during* the *fraudulent* voyage, or *after* the ship has returned to the regular course; for the moment the ship is carried from its right track, with an evil intent, barratry is committed.—Crown Rep. 155.

But the loss, in consequence of the act of barratry, must happen *during the voyage assured*, and within the time limited by the policy; for, if the captain be guilty of barratry by smuggling, and the ship afterwards arrive at the port of destination, and *be there moored at anchor twenty-four hours in good safety*, the underwriters are not liable, if, after this, she should be seized for that act of smuggling.—*Lockyer* v. *Offley;* 1 Term Rep., p. 252.

The sailing out of port, without paying duties, whereby the ship is subjected to forfeiture, is barratrous.—Cowp. 153.

If the act of the captain be done with a view to the benefit

of the owners, and not to advance his own private interest, no barratry is committed. To constitute barratry, it must be *without the knowledge or consent of the owners.*

In the following case all the doctrine on this head was fully considered. It was an action on a policy of assurance upon goods on board the Thomas and Matthew, from London to Seville. The policy was made in the common form, with liberty to touch at any ports or places, &c. The loss was assigned different ways in the declaration: first, by storms and perils of the sea, in consequence of which, the ship was obliged to go to Dartmouth to be repaired; and that afterwards a farther loss happened by storm, &c.: secondly, that it happened by storms and perils of the seas in the voyage generally; and, thirdly, by the *barratry* of the master.

On the trial it was proved, that this ship was put up as a general ship from London to Seville; and was let to freight to one Darwin, to whom she was chartered by Brown, the captain; that it is the course of vessels going on this voyage, to stop at some port in the west of Cornwall, to take in provisions; that this ship having taken her cargo on board, sailed from London to the Downs; that, while she lay there, all the other ships bound to the westward bore away, but she staid till the night after, and then sailed to Guernsey, which was *out of the course of the voyage;* that the captain went there for his own convenience, to take in brandy and wine on his *own account*, after which he intended to proceed to Cornwall; that the night after the ship quitted Guernsey she sprung a leak, which obliged her to put into Dartmouth. When she was refitted, she set sail again, and proceeded for Helford, in Cornwall, where it was always intended she should stop to take in provisions; but, in her way, she received farther damage; and, on her arrival there, was totally incapable of proceeding on the voyage, and the goods were much damaged. It was attempted, on the part of the defendant, to prove that one Willes was the owner of the ship; that the voyage to Guernsey was on his account; and that the goods, taken on board there, were his property; but this evidence went little farther than information and belief; except that it was proved that, when the ship arrived at Helford, the wine was delivered to him in his cellar. The learned judge directed the jury, that, if the going to Guernsey was *without the knowledge* of Darwin, it was barratry, and they ought to find for the plaintiff; but, if done with his knowledge, then it was not barratry; that, if they should be of opinion that it was without the knowledge of Darwin, he desired them to say, whether they thought it was with the knowledge of Willes or not. The jury found a verdict for the plaintiff, and said, they thought the going to Guernsey was without the knowledge of

Darwin, whom they looked upon to be the true owner; but they were of opinion, it was with the knowledge of Willes.

A motion was afterwards made for a new trial: and the case being a question of great consequence to the mercantile world, was twice argued at the bar; after which the judges were unanimously of opinion that the plaintiff was entitled to recover, and the following are their opinions delivered in giving judgment.

Lord Mansfield.—"The ground of the motion for a new trial in this case is, that, under the circumstances, as they were given in evidence to the jury, the carrying the ship to Guernsey was merely a *deviation*, but not *barratry*. Much more stress was laid at the trial, than in either of the arguments upon this fact; namely, that the deviation being with the knowledge of Willes, the owner (though not *pro hac vice*) of the ship, it could never be barratry; and, therefore, the jury were pressed to say, whether it was with the consent of Willes or not; and they said it was. To be sure nothing is so clear, as that, if the owner of a ship assures and brings an action on the policy, he can never set up as a crime a thing done by his own direction or consent. It was therefore a material fact to proceed upon, if Willes had any thing to do in the case; but he had not. It appeared to me, that the nature of barratry had not been judiciously considered or defined, in England, with accuracy. In all mercantile transactions, the great object should be certainty; and, therefore, it is of more consequence that the rule should be certain, than whether the rule is established one way or the other: because speculators in trade then know upon what ground to proceed." His lordship then stated the three cases above quoted from Strange; and, after giving a definition of the word barratry, he proceeded thus: "In this case, the underwriter has assured against all barratry of the master; and we are not now in a case where the owner or freighter is privy to it; if we were, it is evident, that no man can complain of an act to which he is himself a party. In this case, all relative to Willes may be laid out of it; he is originally the owner, but not the assurer here. Darwin was the freighter of the ship, and the goods that were on board were his; if any fraud be committed on the owner, it is committed on Darwin. The question then is, what is the ground of complaint against the master? He had agreed to go on a voyage from London to Seville; Darwin trusts he will set out immediately: instead of which the master goes on an iniquitous scheme, totally distinct from the purpose of the voyage to Seville; that it is a cheat and a fraud on Darwin, who thought he would set out directly; and whether the loss happened in the act of barratry, that is, *during* the fraudulent voyage, or *after*, is immaterial, because

the voyage is equally altered, even though there is no other iniquitous intent. But, in the present case, there is a great deal of reason to say, that the loss sustained was in consequence of the alteration of the voyage. The moment the ship was carried from its right course, it was barratry; and here the loss happened immediately upon the alteration. Suppose the ship had been lost *afterwards*, what would have been the case of the assured, if he were not secured against the barratry of the master? He would have lost his assurance by the fraud of the master; for, it was clearly a deviation, and the assured cannot come upon the underwriters for a loss in consequence of a deviation. Therefore, I am clearly of opinion, that this smuggling voyage was barratry of the master."

Mr. Justice Aston—"I wonder that there should remain a doubt this day, what is meant by barratry in the master. In different ordinances different terms are used, but they all have the same meaning. In one of the ordinances of Stockholm it is called, 'knavery of the master or mariners;' and the facts stated here clearly fall within that description. Where it is a deviation with the consent of the *owner of the vessel*, and the master is not acting for his own private interest, in such case it is nothing but a deviation with the consent of the owner, and the underwriter is excused. In this case, the hull of the ship belonged to Willes; but he had nothing to do with it, having chartered it to Darwin, the jury therefore did right in considering Darwin the owner *pro hac vice*. Having considered him in that light, the conduct of the master was clearly barratry; for he was acting for his own benefit, without intending any good to his owner, and without his consent and privity. Nobody knows when the first commencement of the injury happened, but most probably on the return of the ship to Dartmouth from Guernsey, where he had been for the purpose of smuggling. Therefore, I am clearly of opinion, that this change of the voyage, for an iniquitous purpose, was barratry, which is not confined to the running away with the ship, but comprehends every species of fraud, knavery, or criminal conduct, in the master, by which the owners or freighters are injured."

Mr. Justice Willes.—"The only doubt I had in this case was, at what time the loss happened; and I think it may be reasonably said to have happened in consequence of the smuggling voyage; for, if the ship had proceeded on her first intended course, she would have escaped the storm. Though this was a deviation, yet it is a fair and just rebutter to say, that it was barratry in the master, which is a peril assured against by the policy."

Mr. Justice Ashurst continued of the same opinion which he held at the trial; and the rule for a new trial was discharged

by the unanimous opinion of the whole court.—*Vallejo and another* v. *Wheeler;* Cowp. Rep. 143.

Breach of an embargo is an act of barratry in the master. This was holden by Mr. Justice Buller in the case of *Robertson* v. *Ewer*, before mentioned.

Barratry implies something contrary to the duty of masters and mariners *in the relation in which they stand to the owners of the ship;* and, although they make themselves liable to the owners of *goods*, for misconduct, yet not for *barratry*, which can be committed against the owners of the ship, and them only. This point was determined in an action brought by the assignees of a bankrupt, on a policy of assurance *on goods*, laden in the ship Rachette, for a voyage from London to Rochelle. The cause was tried before Mr. Justice Buller, when a verdict was found for the plaintiff, subject to the opinion of the court upon the following case: That the bankrupt shipped on board the vessel in question goods to the amount of 1800*l.* for Rochelle. That the captain, *by the instigation and direction of Messrs. Le Grand, the owners of the ship, went with the ship and cargo to Bordeaux, instead of Rochelle*, where the cargo was sold by the agent of Le Grand's. That a petition was presented by the plaintiffs to the lieutenant general of the admiralty of Guienne, stating the whole of the transaction between the bankrupt and the owners and captain; that, in order to procure a landing at Bordeaux, their original destination being at Rochelle, false bills of lading were made out by the captain, at the instigation of Le Grand; the petition concluded with a prayer for relief. In consequence of this petition, a decree was passed declaring René Guiné (captain) *guilty of the crime of barratry of the master*, for having signed false bills of lading, &c. For reparation whereof, it sentenced him to perpetual service in the galleys. It also declared Dominique Le Grand guilty, and convicted *of having been an instigator and accomplice of the said barratry* of the master, and adjudged him to five years servitude in the galleys; and also decreed that the said René Guiné and Le Grand should pay to the plaintiffs the amount of their loss and all charges and costs. The question on the case is, whether the plaintiffs were entitled to recover against the assurer.

Lord Mansfield delivered the opinion of the court.—The general question here is on the construction of the word barratry in a policy of assurance. It is somewhat extraordinary, that it should have crept into assurances, and still more, that it should have continued in them so long; for, the underwriter assures the conduct of the captain, whom he does not appoint, and cannot dismiss, to the owner, who can do either. The point to be considered is, whether barratry, in the sense in which it is used in *our* policies of assurance, can be committed against any but

the owners of the ship. It is clear beyond contradiction that it cannot: for, barratry is something contrary to the duty of *master and mariners*, the very terms of which imply, that it must be in the relation in which they stand to the *owners of the ship*. The words used are *the master and mariners*, which are very particular. *An owner cannot commit barratry*. He may make himself liable by his *fraudulent conduct* to the owner of the goods, but not *as for barratry*. And, besides, barratry cannot be committed against the owner, *with his consent*; for, though the owner may become liable for a civil loss by the misbehaviour of the captain, if he consents, yet this is not *barratry*. Barratry must partake of something criminal, and must be committed *against the owner* by the *master* or *mariners*. In the case of Vallejo and Wheeler, the court took it for granted, that barratry could only be committed against the owner of the ship. The point is too clear to require farther discussion.—*Nutt and others, assignees of Hague*, v. *Bourdieu*, 1 Term Rep. 323.

If the owner be also the master of the ship, any act, which, in another master, would be construed barratry, cannot be so in him; but, where the person, who acts as master, is proved to have carried her out of her course for fraudulent purposes of his own, this is *prima facie* evidence of barratry; and it is incumbent on the underwriter, if he can, to prove that such person was owner as well as master.—*Ross* v. *Hunter*, 4 Term Rep. 33.

If the parties insert in the policy that the assurance shall be upon the ship, *in any lawful trade*, and the captain commit barratry by smuggling, the underwriters are answerable. For, otherwise, the word *barratry* would be struck out of the policy; and most clearly the stipulation in the policy, respecting the employment of the ship *in a lawful trade*, must mean, as was said by Lord Kenyon, in delivering the unanimous opinion of the court, *the trade on which she is sent by the owners*.—*Havelock* v. *Hancil*, 3 Term Rep. 277.

A very accurate definition of one species of *barratry* has been laid down in the case of *Ross* v. *Hunter*. This was an assurance on goods on board the Live Oak, at and from Jamaica to New Orleans. She sailed on the voyage assured in May, 1788; and arrived in June following, at the mouth of the river Mississippi. When the captain had got thus far, he dropped anchor, and went in his boat up the river to New Orleans; and, on his return, without carrying the ship to her port of destination, stood away for the Havanna; after his departure whence, he was never afterwards heard of. A verdict was found for the plaintiff against the underwriter. Mr. Justice

Buller said, in one sense of the word, barratry is a *deviation* by the captain, *for fraudulent purposes of his own.* Then the question in this case is, whether the captain did deviate *with a fraudulent view.* The jury have thought that he had a fraudulent intention, and therefore the verdict is right.—4 Term Rep. 33.

A master endowed with a discretionary power, of making the best purchases with dispatch, will not be warranted in trading with an enemy's settlement (although with their permission) unauthorized by his owners, in consequence of which the ship was seized and confiscated. Nor does it make any difference that the benefit of his owners was intended: but the act is barratry.—*Earle* v. *Rowcroft*, 3 East's Rep. 127.

So also, if the master of a ship, *contrary to the instructions of his owner*, cruise for and take a prize, and the vessel is afterwards lost, he is guilty of *barratry*, even though he prosecute the prize in the court of admiralty in the name of himself and his owner, and though the owner had procured a letter of marque solely with a view to encourage seamen to enter, and without any intention of using it for the purposes of cruising; for, whatever is done by the captain to defeat or delay the performance of the voyage, is barratry in him, it being to the prejudice of the owners; and, though the captain might *conceive* what he did was for their benefit, yet, if he acted contrary to his duty to them, it is barratry.—*Moss* v. *Byrom*, 6 Term Rep. 379.

It has been, however, contended, that, if a vessel deviated from the voyage assured, *through the ignorance of the captain*, it amounted to barratry. But the court of King's Bench, after considerable argument, were unanimously of opinion, that there must be *fraud* to constitute barratry.*—*Plyn* v. *Roy*, Exch. Ap. 7 Term Rep. 505.

VI. *Partial Losses and Adjustment.*

A total loss does not always mean that the property assured is irrecoverably lost or gone; but that, by some of the perils mentioned in the policy, it is in such a condition as to be of little

* The underwriters are accountable for barratry, as above; but if the captain be also the supercargo—that is, if the cargo be consigned to him—he cannot commit barratry: or, in other words, any act committed by him, which would constitute barratry in him, if the cargo were not consigned to him, would be disregarded by the underwriters, as the consignment to him releases them from the payment of all damages accruing from such acts. Such was the case with the captain of the brig Hollon, of Philadelphia, in 1810. The cargo of this vessel was consigned to captain Willis, her commander, and she was insured to one or more ports. Captain Willis deviated from the specifications of the policy of insurance; in consequence of which the underwriters were discharged, and the premium was forfeited by the shippers.

use or value to the assured, and so much injured as to justify him in abandoning it to the assurer, and in calling upon him to pay the whole amount of his assurance, as if a total loss had actually happened. But a total loss is so intimately blended with the doctrine of abandonment, that we shall refer what may be said on the subject till we come to the head of Abandonment. Here it will be sufficient to remark, that, in case of a total loss, literally so called, the *prime cost* of the property assured, or the value mentioned in the policy, must be paid by the underwriter, at least as far as his proportion of the assurance extends. The assurer has nothing to do with the market; he has no concern in any profit or loss which may arise to the merchant from the sale of the goods. If they be totally lost, he must pay the value of the thing he assured at the *outset;* he has no concern in any subsequent value. So, if part of the cargo, capable of a several and distinct valuation at the outset, be totally lost, as, if there be one hundred hogsheads of sugar, and ten happen to be lost, the assurer must pay the prime cost of those ten hogsheads, without any regard to the price for which the other ninety may be sold.

The word average, in *policies*, has two significations; it means "*a contribution to a general loss;*" and it is also used to signify "*a particular partial loss.*" That which means "*a contribution to a general loss*" will be treated of in the next division.

Partial loss (the subject of our present inquiry) implies a damage which the ship may have sustained, in the course of her voyage, from any of the perils mentioned in the policy; when applied to the cargo, it means the damage which goods may have received, without any fault of the master, by storm, capture, stranding or shipwreck; although the whole, or the greater part thereof, may arrive in port. These partial losses fall upon the owners of the property so damaged, who must be indemnified by the underwriter. But the underwriters of London expressly declare, as appears from a memorandum at the foot of the policy, that they will not answer for partial losses, not amounting to 3 *per cent.* This clause was intended to prevent the underwriters from being continually harassed by trifling demands. But, at the same time that they provide against trifling claims for *partial* losses, they undertake to indemnify against losses, however inconsiderable, that arise from a *general* average.

When we speak of the underwriters being liable to pay, whether for total or partial losses, it must always be understood, that they are liable only in proportion to the sums which they have underwritten. Thus, if a man underwrites 100*l.* upon property valued at 500*l.*, and a total loss happen, he shall be an-

swerable for 100*l.* and no more; that being the amount of his subscription; if only a partial loss amounting to 60*l.* or 70*l.* *per cent.* upon the whole value, he shall pay 60*l.* or 70*l.* being his proportion of the loss.

As to the question of how the proportion of damage is to be ascertained, the grand and leading case is that of *Lewis and another* v. *Rucker;* 2 Burr. 1167, from which, as it was so ably treated by Lord Mansfield, we think it necessary to give copious extracts.

A rule having been obtained by the plaintiffs, who were assured, for the defendant, (the assurer,) to show cause, why a verdict, obtained by him, should not be set aside and a new trial had.

The court, after hearing the matter duly debated, took time to advise, and their unanimous opinion was delivered to the following effect, by

Lord Mansfield.—This was an action brought upon a policy, by the plaintiffs, for Mr. James Bourdieu, upon the goods on board a ship, called the Vrow Martha, at and from St. Thomas's Island to Hamburg, from the loading at St. Thomas's Island till the ship should arrive and land the goods at Hamburg. The goods, which consisted of sugars, coffee, and indigo, were valued: the clayed sugars at 30*l.* *per* hogshead; the Muscovado sugars at 20*l.* *per* hogshead; and the coffee and indigo were likewise respectively valued. The sugars were warranted free from average, (that is, partial loss,) under 5*l.* *per cent.*, and all other goods free from average under 3*l.* *per cent.*, unless general, or the ship be stranded.

In the course of the voyage, the seawater got in: and, when the ship arrived at Hamburg, it appeared that every hogshead of sugar was damaged. The damage the sugars had sustained made it necessary to sell them immediately; and they were accordingly sold; but the difference between the price which they brought, on account of the damage, and that which they might then have been sold for at Hamburg, if they had been sound, was as 20*l.* 0*s.* 8*d.* *per* hogshead is to 23*l.* 7*s.* 8*d.* *per* hogshead: (that is, if sound, they would have been 23*l.* 7*s.* 8*d.* *per* hogshead:) as damaged, they were only worth 20*l.* 0*s.* 8*d.* *per* hogshead.

The defendant paid money into court, by the following rule of estimating the damage: *he paid the like proportion of the sum, at which the sugars were valued in the policy, as the price of the damaged sugars bore to sound sugars at Hamburg, the port of delivery.* And the only question was, by what measure or rule the damage, upon all the circumstances of the case, ought to be estimated.

The special jury (amongst whom there were many sensible

merchants) found the defendant's rule of estimation to be right, and gave their verdict for him.

And it is now the duty of the court to say, whether the jury have estimated the damage by a proper measure. This is the rule by which it was estimated.

The defendant takes the proportion of the difference between sound and damaged at the port of delivery, and pays that proportion upon the value of the goods specified in the policy; and has no regard to the price in money, which either the sound or the damaged goods bore in the port of delivery. He says, the proportion of the difference is equally the rule, whether the goods come to a rising or a falling market. For instance, suppose the value in the policy to be 30*l.*; the goods are damaged, but sell for 40*l.*—If they had been sound they would have sold for 50*l*; the difference then between the sound and damaged is a fifth, consequently the assurer must pay a fifth of the prime cost, or value in the policy, that is 6*l.*—*è converso*, if they come to a losing market, and sell for 10*l.*, being damaged, but would have sold for 20*l.* if sound, the difference is one half: the assurer must pay half the prime cost, or of the value of the policy, that is 15*l.*

To this rule an objection has been made: that it is going by a different measure in case of a partial loss, from that which governs in case of a total: for, upon a total loss, the prime cost or value in the policy must be paid. The answer to such objection is, that the distinction is founded on the nature of the thing. Assurance is a contract of indemnity, against the perils of the voyage, to the amount of the value in the policy; and therefore, if the thing be totally lost, the assurer must pay the whole value which he assured at the outset. But where a part of the commodity is spoiled, no measure can be taken from the prime cost to ascertain the quantity of the damage sustained. The only way is, to fix whether the thing be a third or fourth worse than the sound commodity; and then you pay a third or fourth of the prime cost, or value of the goods so damaged.

We are of opinion, that the rule by which the jury have gone is the right measure.

Wherever there is a specific description of casks or goods, the rule of estimating the average is as above stated; but, in a subsequent case, the property, which consisted in various goods taken from an enemy, was valued at the sum assured, and part was lost by perils of the sea; consequently the same rule could not be adopted, on account of the nature of the thing assured. The only mode was, to go into an account of the whole value of the goods, and to take a proportion of that sum to the amount

of the goods lost. *Le Cras* v. *Hughs*; Easter Term, 22 Geo. III.

Since the 10 Geo. II., the constant usage has been to let the valuation fixed in the policy remain, in case of a total loss; unless the defendant can show that the plaintiff had a colourable interest only, or that he has greatly overvalued the goods; but a partial loss opens the policy, so that the value of the goods must be proved.

Some goods are in their nature perishable; and therefore the underwriters have, by express words inserted in their policy, declared, that they will not be answerable for any partial loss happening to *corn*, *fish*, *salt*, *flour*, and *seed*, unless it arise by way of a general average, or unless the ship be stranded. Upon this clause it is necessary to observe, that corn is a general term, and includes many particulars; peas and beans have been held to come within the meaning of the word. *Mason* v. *Skurray*; sittings after Hilary, 1780.

But in a trial, at Guildhall, in the Common Pleas, Mr, Justice Wilson was of opinion, that the term *salt* did not include *saltpetre*. *Journu* v. *Bourdieu*; sittings after East. Term, 27 Geo. III.

There cannot be a total loss of corn, fish, salt, fruit, flour, or seed, but by the *absolute destruction* of the thing assured; for, while it *specifically* remains, though wholly unfit for use, and though the loss of it exceeds the sum to be paid for the freight of it, this is not such a loss as is to be borne by the underwriters. *Wilson* v. *Smith*; 3 Burr. 1550. *Mason* v. *Skurray*; sittings after Hilary Term, 1780. *Cocking* v. *Fraser*; K. B., 25 Geo. III.

The case of *M'Andrews* v. *Vaughan*, (sittings at Guildhall, after Mich., 1793,) was an assurance on *fruit* from Lisbon to London. The ship was captured and recaptured, brought into Portsmouth, and afterwards arrived at London: but the cargo, by the capture, recapture, and consequent length of the voyage, had sustained a damage of 80*l.* *per cent.* The assured never heard of the capture till the ship was safe at Portsmouth, and then he offered to abandon. Lord Kenyon said, "as there had been no stranding, there cannot be a recovery for a partial loss. Had the plaintiff heard of the capture *only*, he might have abandoned; but he heard nothing of the accident till the ship was in safety. The cargo arrives at the port of destination, and though it is good for very little, yet it has been invariably holden, that either the voyage must be lost, or the cargo (if it be one of those mentioned in the memorandum) must be wholly and actually destroyed to entitle the assured to recover." The plaintiff was according nonsuited.

For, as to these articles, the underwriters are liable for par-

tial losses in two cases only, viz: that of a general average, or if the ship be stranded. *Nesbitt* v. *Lushington;* 4 Term Rep., 783.

But, in the long disputed case of *Burnett* v. *Kensington*, (7 Term Rep., 210,) two questions on this subject came under consideration: the first was, What should be deemed to be a *stranding?* and the second was, Whether the loss must actually arise from the *stranding?* It was on a policy of assurance on *fruit*, on board the Commerce, at and from Malaga, to Plymouth and Portsmouth. On the 30th of November, 1794, the ship sailed from Malaga with a cargo of lemons and oranges: on the 29th of January, 1795, she arrived off Scilly; and between seven and nine in the morning of that day, struck on a sunken rock: she did not remain on the rock; but, in consequence of her striking thereon, several of her planks were started, and the water immediately after flowed into the hold and over the cargo, and continued to increase in the hold for about three hours and a half. About twelve o'clock on the same day, the ship was stranded, on the beach at Scilly, by the captain, under direction of a pilot, who had come on board her from the shore, in order to save the ship and cargo. The ship continued some time upon the beach, during which time the water again flowed in and over part of the cargo at the return of the tide. The ship afterwards proceeded on her voyage, and arrived at Plymouth on the 24th of February following. The cargo of fruit was very much damaged; and a small part thereof left at Scilly, being entirely unfit for use. The ship received no damage in consequence of the stranding: the damage she received was entirely from the rock on which she struck: part of the damage the cargo received was occasioned by the water flowing into the ship previous to her being laid on the beach, and part was occasioned by the water that flowed in subsequent to the time of her being laid on the beach: but the cause of the water flowing in arose entirely from the ship striking on the rock, and not from any mischief done to the ship by the stranding. These were the facts of the case, which, however, had been tried four times before they could be so agreed on. The jury at length determined, that, although the ship was gotten off without any damage, yet it was a *stranding;* and the court declared the law to be, that, as a stranding had happened *bona fide*, and without any fraudulent design, the *condition* had occurred which rendered the underwriter liable for a partial loss, although the damage sustained was *not* occasioned by the stranding.

In a later case at Guildhall, Lord Kenyon told the jury, that a ship's returning on some wooden piles, four feet under water, erected on Wisbeach river, to keep up the banks of the shore,

and laying on such piles till they were cut away, was a *stranding*, within the policy, *Dobson* v. *Bolton;* sittings after Easter, 1799.

The damage sustained by a partial loss must be ascertained by the difference between the respective gross proceeds of the same goods when sound and when damaged, and not the net proceeds. *Johnson* v. *Sheddon;* Term Rep. Trinity, 42, Geo. III.

When the quantity of damage sustained in the course of the voyage is known, and the amount, which each underwriter of the policy is liable to pay, is settled, it is usual for the underwriter to indorse on the policy, "*adjusted this loss at so much per cent.*" or some words to the same effect. This is called an adjustment.

After an adjustment is signed by the underwriter, if he refuse to pay, the owner has no occasion to go into a proof of his loss, or any of the circumstances respecting it, unless fraud were used in obtaining the adjustment: or unless there had been some misconception of the law or fact upon which it was made. *Rodgers* v. *Maylor;* sitt. after Trin. 1790, and *De Garran* v. *Galbraith*, Mich. Term, 36 Geo. III.

If any assurer pay money for a total loss, and in fact it be so at the time of adjustment; if it afterwards turn out to be only a partial loss, he shall not recover back the money so paid to the assured; for, substantial justice is done by putting him in the place of the assured, and giving him all the advantages that arise from the salvage. *Da Costa* v. *Frith;* 4 Burr. 1766.

VII. *General Average.*

Whatever the master of a ship in distress does for the preservation of the whole, in cutting away masts or cables, or in throwing goods overboard to lighten his vessel, which is what is meant by jettison or jetson, is permitted to be brought into a general average: in which all who are concerned in ship, freight, and cargo, are to bear an equal or proportionable part of the loss of what was so sacrificed for the common welfare; and it must be made good by the assurers in such proportions as they have underwritten. 1 Magens, 55.

In order to make the act of throwing the goods overboard legal, the ship must be in distress, and the sacrificing a part must be necessary to preserve the rest.

If a ship ride out the storm, and arrive in safety at the port of destination, the captain must make regular protests, and must swear, in which some of the crew must join, that the goods were cast overboard for no other cause but for the safety of the ship, and the rest of the cargo. Beawes, 146. Molloy, 1. 2, c. 6. s. 2.

There can be no contribution (which is another word frequently used for this species of *average*) without the ejection of some goods, and the saving of others : but it is not always necessary for the purpose of contribution, that the ship should arrive at the port of destination.

If the jettison does not save the ship, but she perish in the storm, there shall be no contribution of such goods as may happen to be saved ; because the object for which the goods were thrown overboard was not attained. But if the ship, being once preserved by such means, and continuing her course, should afterwards be lost, the property saved from the second accident shall contribute to the loss sustained by those whose goods were cast out upon the former occason. 1 Magens, 57.

It is hardly necessary to state, with minuteness, the various accidents and charges that will intitle the party suffering to call upon the rest for a contribution ; because we may refer them all to this principle, that all losses sustained, and expenses incurred, voluntarily and deliberately, with a view to prevent a *total loss* of the ship and cargo, ought to be equally borne by the ship and her remaining lading. Such, for instance, is the damage sustained in defending a ship against an enemy or pirate ; such as the expense of curing and attendance upon the officers or mariners wounded in such defence ; and such also is the sum which the master may have promised to pay for the ransom of his ship to any privateer or pirate, when taken.* A master who has cut his mast parted with his cable, or abandoned any part of the ship and cargo in a storm, in order to save his ship, is well entitled to this compensation : but if he should *lose* them by the storm, the loss falls only upon the ship and freight ; because the tempest only was the occasion of this loss, without the deliberation of the master and crew ; and it was not done with a view to save the ship and lading. Upon the same principle it is established, that, when a ship arrives at the mouth of a harbour, and the master, finding that his ship is too heavy laden to sail up, is obliged to put a part of the cargo into hoys and barges, the owners of the ship and of the goods that remained are obliged to contribute if the lighters perished. But if the ship should be lost, and the lighters saved, the owners of the goods so preserved were not to contribute to the proprietors of the ship and cargo lost. Magens, 96. 183.

The difference is this, the lightening of the ship was an act of deliberation for the general benefit : whereas the circumstances of the lighters being saved, and ship lost, was accidental, and no way proceeding from a regard for the whole. 1 Magens, 56.

* This charge, however it may exist with foreigners, cannot be brought into an average for a British ship or cargo ; for, by the 22d Geo. III., c. 25, the ransoming any such is made void, and is expressly forbidden.

It is not only the value of the goods thrown overboard that must be considered in a general average, but also the value of such as receive any damage by wet, &c., from the jettison of the rest.—Beawes, 148. Mollow, 1. 2, c. 6, s. 8.

If a ship be taken by force, carried into some port, and the crew remain on board to take care of and reclaim her, not only the charges of reclaiming shall be brought into a general average, but the wages and expense of the ship's company during her arrest, from the time of her capture, and being disturbed in her voyage.—Beawes, 150. fo.

But sailor's wages and victuals, when they are under the nenessity of performing quarantine, (in which case the master would have been obliged to maintain and pay them, though his vessel had arrived only in ballast,) do not come into general average, yet charges, occurring by an extraordinary quarantine, shall be brought into a general average.

Whether the extraordinary wages and victuals, expended during the detention by a foreign prince not at war, ought to be brought into a general average, so as to charge the underwriter, has never been expressly determined, although it seems to be the general opinion that they should.

So, likewise, where a ship is obliged to go into port for the benefit of the whole concern, the charges of loading and unloading the cargo, and taking care of it, and the wages and provisions *of the workmen hired for the repairs*, become general average.—*Du Costa* v. *Newnham*; 2 Term Rep., 407.

By the ancient laws of Rhodes, Oleron, and Wisbuy, the ship and all the remaining goods shall contribute to the loss sustained. The most valuable goods, though their weight should have been incapable of putting the ship in the least hazard, as diamonds or precious stones, must be valued at their just price in this contribution, because they could not have been saved to the owners but by the ejection of the other goods. Neither the persons of those in the ship, nor the ship provisions, nor the respondentia bonds, suffer any estimation: nor does wearing apparel in chests and boxes, nor do such jewels as belong to the person merely; but if the jewels are a part of the cargo, they must contribute.

Those who carry jewels by sea ought to communicate that circumstance to the master; because the care of them will be increased in proportion to their worth, to prevent them being thrown over-board promiscuously with other things: and hence their preservation will be a common benefit.—1 Magens, 63.

The wages of sailors are not to contribute to the general loss; a provision intended to make this description of men more ca-

sily consent to a jettison, as they do not then risk them at all, being still assured that their wages will be paid.—Magens, 71.

The way of fixing a right sum, by which the average ought to be computed, can only be by examining what the whole ship, freight, and cargo, if no jettison had been made, would have produced net, if they all had belonged to one person, and been sold for ready money. And this is the sum whereon the contribution should be made, all the particular goods bearing the net proportion.—1 Magens, 69.

Gold, silver, and jewels, contribute to general average, according to their full value, and in the same manner as any other species of merchandise.—1 Magens, 62; and *Peters* v. *Milligan*; sittings at Guildhall after Michaelmas, 1787.

The contribution is in general not made till the ship arrive at the place of delivery; but accidents may happen, which may cause a contribution before she reaches her destined port. Thus, when a vessel has been obliged to make a jettison, or by the damages suffered, soon after sailing, is obliged to return to her port of discharge, the necessary charges of her repairs, and replacing the goods thrown over-board, may then be settled by a general average.—1 Magens, 60.

From the result of the adjoined action, this conclusion is deducible:

If A. let his ship to B., who engages to keep it in repair during the whole time of the voyage; for which A. is to receive freight at the return of the ship; and if, for safety, it be necessary to refit at some port, the expense of refitting must be borne by A.; nor is B. liable, if he have an interest in the cargo, to contribute his proportion as in a general average.

The plaintiff Jackson, owner of the Britannia, let her to hire, in 1796, to the defendant, for a voyage from London to India and back again. The ship arrived safely at Bengal. On her return, a partial jettison being necessary for the general safety, it was performed by throwing over-board some spare materials and part of the cargo. Thus lightened she arrived in Table Bay, at the Cape of Good Hope, 16 Feb. 1797. In pursuance of the opinion expressed by the agents for all parties, the ship was surveyed, and repaired. The amount of the repairs and other incidental charges thence accruing, was 4395*l.* 4*s.* 6*d.* *Qu.* Is the defendant liable to such general average as arises from the goods thrown over-board, or, also, to general average on the repairs, &c., at the Cape of Good Hope?

The defendant not to bear any part of the expense incurred at the Cape.—*Jackson and another* v. *Charnock*; 8 East's Term Rep., 509.

It is necessary here to add, that, as all sums which are paid on account of general average may be recovered by action from

the underwriters, so any person, whose goods have been thrown over-board, or who has expended money, for the general preservation of ship and cargo, may obtain repayment by application to a court of equity for a general contribution.

The following Examples of adjusted Averages are here subjoined, having received the Approbation of some experienced Merchants.

The Seahorse, Captain Dix, laden with hemp, flax, and iron, bound from Riga to London, ran on shore, coming through the Grounds, at Elsinoer; the captain hired a great number of men and several lighters to lighten the ship and get her afloat again; which was soon done, but he was obliged to pay 120*l.* for their assistance. This expense being incurred to preserve both ship and cargo, the average must consequently be general. When the ship arrived at London, the captain immediately made a protest and an average bill; he then went to the merchant, to whom his goods were addressed, to have it signed, and to know the value of each man's property.*

Average accruing to the ship Seahorse, from Riga to London, in 1782, for assistance in getting off the strand of Elsinoer.

		l.	*s.*	*d.*
To sundry charges paid at the Sound for lighters and assistance in getting the ship off		120	0	0
Protest and postages - - -		2	0	0
		122	0	0
Should the ship arrive at London she will make 700*l.* freight - - - -		700	0	0
Wages, for all the people, 3 months and 10 days - - -	139 10 0	250	0	0
Victuals for ditto - -	110 10 0			
Freight to contribute -		450	0	0

* The cargo is answerable to the master for the payment of general average.

An American ship arrived at Bordeaux in 1804, while I was there, having made a general average on her passage from the United States, by throwing part of the cargo over in a storm. The captain did not settle the general average until he returned to the United States, and as I was informed, he had much trouble in recovering it from the shippers, some part of which he did not obtain, though justly due, by reason that some were not able to pay, so that it is best to settle the general average on the spot, at the port of discharge.

	l.	s.	d.
Ship Seahorse valued at - - - -	4000	0	0
Freight valued at - - - - -	450	0	0
F. J. for value of hemp, as *per* invoice -	6000	0	0
D. N. for value of flax - - -	1000	0	0
T. R. for value of iron - - - -	350	0	0
	11,800	0	0

If 11,800*l.* loss give 122*l.* what will 100*l.* loss give?

Answer—1*l.* 0*s.* 8*d.* *per cent.*

The ship must bear 4000*l.* at 1*l.* 0*s.* 8*d.* (which the assurers return - - - -	41	7	2
Freight, 450*l.* at 1*l.* 0*s.* 8*d.* *per cent.* - -	4	13	0
F. J. pays the captain for 6000*l.* at the same rate	62	0	6
D. N. pays the same for 1000*l.* - -	10	7	0
T. R. pays the same for 350*l* - - -	3	12	4
	122	0	0

The Mary, Capt. T., partly laden with goods, sailed in May, 1782, from London, bound to St. Petersburg. She sailed the 3d of that month, and after an agreeable passage, arrived at Elsinoer on the 10th, whence she sailed the same day, with a fair wind, for St. Petersburg: the next day a heavy gale of wind rose contrary, insomuch that it obliged the captain to bear away for Elsinoer again; but night coming on, and the gale increasing, it being so dark that it was unsafe to continue running in such a dangerous place, thickly beset with many sands, and having a strong current, the captain judged it best to bring the ship to an anchor, which he accordingly did in 15 fathoms water. Before the ship had been at anchor half an hour she began to drive; and, as she still kept driving, with both anchors ahead, and the wind blowing stronger and stronger, they found it impossible to purchase their anchors: then the captain and ship's company judged it safest to cut the cable, in order to save their own lives and the ship and cargo, and take their chance in running for the Roads: luckily they got safe in, and the weather abating, they brought up with a small anchor.

The Mary then wanted cables and anchors before she could proceed to St. Petersburg; the master, therefore, went directly on shore, bought them, and paid the following sums:

				l.	*s.*	*d.*
Protest - - - - - -				0	10	0
Two new cables and buoy ropes	89	10	0			
One third always deducted for new	29	16	8	59	13	4
Two anchors and two buoys - -				37	15	0
Charges in getting them on board, &c. -				2	1	8
				100	0	0

As the cables were cut away for preservation of ship and cargo, it must be a general average, and both must contribute to pay the damages sustained. The captain made the following average bill, on his arrival at Petersburg, in order to recover the damages.

Average accrued to the Mary, for the loss of her anchors and cables, in prosecuting her voyage from London to St. Petersburg, 1782.

	l.	*s.*	*d.*
Ship Mary valued at - - -	800	0	0
Freight (after wages and victuals deducted) valued at - - -	50	0	0
O. P.'s value of goods - -	700	0	0
V. R.'s value of goods - -	225	0	0
T. T.'s value of goods - -	25	0	0
	1800	0	0

If 1800*l.* loss gives 100*l.* what will 100*l.* loss give?

Answer—5*l.* 11*s.* 1*d.* *per cent.*

The ship must bear 800*l.* at 5*l.* 11*s.* 1*d.* *per cent.*				44	8	8
The freight must bear 50*l.* at the same				2	15	8
O. P. must pay the captain, at St. Petersburg for 700*l.*, at the same	38	17	9			
V. R. must pay for 225*l.* at the same	12	10	0			
T. T. must pay for 25*l.* at the same	1	7	11			
				52	15	8
				100	0	0

Having received 52*l.* 15*s.* 8*d.* of the owners of the goods, at Petersburg, the captain sends his protest and average bill to his owner to receive of the underwriters their shares of the loss upon the *ship* and *freight*.

Captain T. of the Sea Adventure, bound from London to Virginia, in ballast, was riding at anchor in the Downs, with a large fleet of ships, in a gale of wind. She had not been at anchor long before she began to drive, and the captain, perceiving her to be in great danger of being on shore, or else foul of the other vessels, judged it safest to cut his cables, as he must have been driven on shore if he had not. After the gale was over, he went to Dover, bought new anchors and cables, and drew upon his owner for the amount of them, as follows:

	l.	*s.*	*d.*
Two anchors and buoys - -	34	18	0
Ropemaker's bill for new cables, &c. -	54	2	0
Protest - - -	0	10	0
Charges of getting them on board -	2	15	0
	92	5	0

The captain then sent the charges of reinstating the cables and anchors cut away, and of the protest, to his owner, that he might recover of the assurers the damage sustained.

State of the Sea Adventure's Average.

				l.	*s.*	*d.*
Two anchors and buoys - -				34	18	0
Ropemaker's bill - -	54*l.*	2	0	36	1	0
One third always deducted for new	18	0	8			
Protest - - - -				0	10	0
Charges in getting the anchors, &c. -				2	15	0
				74*l.*	4	4

Ship valued at 2000*l.*

If 2000*l.* loss give 74*l.* 4*s.* 4*d.* what will 100*l.* loss give?
Answer—3*l.* 14*s.* 2½*d.* *per cent.*

Observe, if a ship had been riding in a gale of wind, and the cables had parted, that loss would have fallen upon the owners; for, the underwriters are not liable to pay for wear and tear.

This may serve as a similar case for all ships in ballast that have cut away their masts, cables, &c. for preservation.

A loaded ship met with such exceeding bad weather, that the master and mariners found it impossible to save her without

throwing part of her cargo overboard, which they are authorized to do for preservation. Being thus necessitated, they threw such goods overboard as lay nearest at hand, and lightened the ship of ten casks of hardware and thirty hogsheads of sugar, which they judged sufficient to keep her from sinking. Soon after that, the ship arrived at her destined place, and then an average bill was immediately made, in order to adjust the loss, and to pay the proprietor of those goods which were thrown over for the good of the whole.

Average accrued to the ship —— for goods thrown overboard, for preservation of the ship, freight, and cargo.

	l.	s.	d.
Ship valued at - - -	2000	0	0
Freight (wages and victuals deducted)	200	0	0
J. R.'s value of goods - -	6000	0	0
J. P.'s value of goods - -	300	0	0
R. F.'s value of goods - -	1500	0	0
A. W. for 30 hogsheads of sugar - -	800	0	0
L. L. for 10 casks of hardware - -	1200	0	0
	12000	0	0

If 12000*l.* loss give 2000*l.* what will 100*l.* loss give?

Answer—16*l.* 13*s.* 4*d.* *per cent.*

	l.	s.	d.
Mr. A. W.'s goods, thrown overboard, were valued at - - -	800	0	0
Mr. L. L.'s goods, ditto - - -	1200	0	0
	2000	0	0

	l.	s.	d.
The ship must pay to A. W. and L. L. for 2000*l.* at 16*l.* 13*s.* 4*d.* *per cent.* - -	333	6	8
The freight 200*l.* at 16*l.* 13*d.* 4*d.* *per cent.*	33	6	8
J. R. for 6000*l.* at the same - -	1000	0	0
J. P. for 300*l.* at the same - -	50	0	0
R. F. for 1500*l.* at the same -	250	0	0
	1666	13	4

A. W. and L. L. receive, of the owners of the goods saved, and of the ship's owners or captain, 1666*l.* 13*s.* 4*d.* for the

value of their goods thrown over-board; which they divide thus:

If 2000*l.* receive 1666*l.* 13*s.* 4d. what will 800*l.*?

Answer	666	13	4
Assurers pay for 800*l.* at 16*l.* 13*s.* 4*d.* *per cent.*	133	6	8
	800	0	0

A. W. receives of the underwriters 16*l.* 13*s.* 4*d.* *per cent.* for the sum that he assured, and of the owners of what was saved 666*l.* 13*s.* 4*d.* which is equal to the loss he sustained by his property being thrown overboard.

	l.	*s.*	*d.*
L. L. receives, of the owners of the ship and goods preserved - - -	1000	0	0
And of the assurers, for the 1200*l.* which he had assured, at 16*l.* 13*s.* 4*d.* *per cent.*	200	0	0
Value of L. L.'s property	1200	0	0

It is usual for the owners of goods preserved, and also for the owner of the ship, to pay their average to the sufferers on receipt of their goods and on delivery of the ship; their redress being upon the assurers, who must return the same.

The Mary, Captain Thompson, at Leghorn, bound to London, sailed with a fair wind, which continued for some days, when she was boarded by pirates, who forcibly took away six large guns, two cables, two anchors, much cabin furniture, and one compass, leaving the ship without other damage. A violent storm afterwards arose, which disabled the ship so much, that the men, who laboured hard at the pumps, could scarcely keep her from sinking. This continued so long, that the men, wearied out, gave themselves up for lost, and discontinued their labour. The captain supplied them with wine, and, to animate them, promised a gratuity of 20 guineas to each man if they brought the ship safe into port. This gave the men such spirits, that though they lost all their masts, they brought the ship safe to London under jurymasts, &c.

Here was a *general* and a *particular* average. But, although the gratuity given to the seamen was to preserve both ship and cargo, and was admitted into a general average, it was done so

only as a matter of favour, and not of right. What the pirates stole, and other damages done to the ship, must make a particular average.

The sloop Christian and Betsey, Captain Watson, on her passage from St. Ubes to Bristol, met with a very heavy gale of wind, the sea breaking over her, and the vessel making much water; the captain determined on *cutting away* the jib, as he could not take it in; but, before that could be done, a sea struck the vessel, and *broke the bowsprit.* The wreck of the bowsprit, jib, &c., broke the lashing of the larboard anchor, and carried it and the cable over-board. In order to preserve ship and cargo, he cut the whole of this wreck away. During the said gale of wind, the masts having lost great part of their support in the loss of the bowsprit, he prevailed on one of his men, for a gratuity of five guineas, to go aloft, and cut away the topsail, topgallant-sail, yards, mast, and rigging; and, at last, the vessel reached her port of delivery.

Had the jib been *cut away*, it would have been general average; and it was only under the particular circumstances of being carried away, while that was in contemplation, it was allowed as a particular average on the ship, as was likewise the bowsprit. The entangling with the anchor and cable, though a consequence of the above, yet being *cut away*, came into general average, as did the topmast, &c. The gratuity to the seaman was not allowed, on the principle that a seaman is bound, by his duty and wages, to do *all* in his power for the good of the ship, and he can therefore earn no more.

General Average.

	l.	*s.*	*d.*
Blocks for topmast rigging - -	2	12	3
Running rigging - - -	10	7	2
Topsail-yard - - -	1	12	0
Topsail - - -	8	5	3
Topgallant-sail - - -	5	16	0
Cable - - -	23	2	6
	51	15	2
One third off	17	5	0
	34	10	2

Carried forward.

	l.	s.	d.
Brought forward,	34	10	2
Surveyors 3 guineas, protest 2*l.* - -	5	2	0
Anchor - - - -	9	5	0
Anchor stock - - -	0	11	0
Postages - - -	0	1	10
	49	10	0

N. B. No deduction is made from the value of an anchor.

Ship	500*l.*			
Cargo	352			
Nett freight	100			
	952, at 5*l.* 4*s. per cent.*, is	49	10	0

Particular Average on the Ship.

	l.	s.	d.
Blockmaker's bill - - -	1	2	9
Ropemaker's account for stays, &c. -	6	3	6
Bowsprit, &c. - - -	6	13	0
Jib - - -	10	19	6
Carpenter's and smith's bill - -	5	10	7
Postage - - - -	0	0	7
	30	14	11
One third	10	4	11
	20	10	0
Ship 500*l.* at 4*l.* 2*s. per cent.*, is	20	10	0

N. B. The above average comes above 3 *per cent.*; had it been below, the underwriters would not have been liable to pay it

VIII. *Salvage.*

Salvage is an allowance made for saving a ship, or goods, or both, from the dangers of the seas, fire, pirates, or enemies. What that allowance is may be collected from a review of the following acts of parliament.

It appears, from the act of 12 Anne, st. 2, 18, that, if a ship was in danger of being stranded, or run ashore, the sheriffs, justices, mayors, constables, or officers of the customs, nearest the place of danger, should, upon application made to them,

summon and call together as many men as should be thought necessary to the assistance and for the preservation of such ship in distress and her cargo; and that, if any ship, man of war, or merchantman, should be riding at anchor near the place of danger, the constables and officers of the customs might demand, of the superior officers of such ship, the assistance of his boats and such hands as could be spared: and that if the superior officer should refuse to grant such assistance, he should forfeit 100*l*.

It then proceeds: "And, for the encouragement of such persons as shall give their assistance to such ships or vessels so in distress as aforesaid, be it enacted, that the said collectors of the customs and the master and commanding officer of any ship or vessel, and all others who shall act or be employed in the preserving of any such ship or vessel in distress, or their cargoes, shall within thirty days after the service is performed, be paid *reasonable reward* for the same, by the commander, master, or other superior officer, mariners, or owners, of the ship or vessel so in distress, as aforesaid, by any merchant whose vessel or goods shall be so saved: and, in default thereof, the said ship or vessel, so saved, shall remain in the custody of the officers of the customs, until all charges are paid, and until the officers of the customs, and the master or other officers of the ship or vessel, and all others employed in the preservation of the ship, shall be *reasonably gratified* for their assistance and trouble, or good security given for that purpose, to the satisfaction of the parties that are to receive the same: and, if any disagreement shall take place between the persons, whose ships or goods have been saved, and the officer of the customs, touching the moneys, deserved by any of the persons so employed, it shall be lawful for the commander of the ship or vessel so saved, or the owner of the goods, or the merchant interested therein, and also for the officer of the customs, or his deputy, to nominate three of the neighbouring justices of the peace, who shall thereupon adjust the *quantum* of the moneys or gratuities to be paid to the several persons acting or being employed in the salvage of the said ship, vessel, or goods; and such adjustment shall be binding upon all parties, and shall be recoverable in an action at law; and, in case it shall so happen, that no person shall appear to make his claim to all or any of the goods that may be saved, that then the chief officer of the customs, of the nearest port to the place where the said ship or vessel was so in distress, shall apply to three of the nearest justices of the peace, who shall put him or some other responsible person in possession of the said goods, such justices taking an account in writing of the said goods, to be signed by the said officer of the customs: and, if the said goods shall not be legally claimed, within the space

of twelve months next ensuing, by the rightful owner thereof, then public sale shall be made thereof; and, if perishable goods, forthwith to be sold, and, after all charges deducted, the residue of the moneys arising from such sale, with a fair and just account of the whole, shall be transmitted to her Majesty's Exchequer, there to remain for the benefit of the rightful owner, when appearing; who, upon affidavit, or other proof made of his or their right or property thereto, to the satisfaction of one of the barons of the coif of the Exchequer, shall, upon his order, receive the same out of the Exchequer."

In case of *wreck*, therefore, the rate of salvage is not fixed, but must be *reasonable;* and this to be ascertained by three justices of the peace.

By the 26 Geo. II. c. 19, s. 5, it is farther enacted, "that, in case any person or persons, not employed by the master, mariners, or owners, or other person or persons lawfully authorized, in the salvage of any ship or vessel, or the cargo or provision thereof, shall, in the absence of the persons so employed and authorized, save any such ship, vessel, goods, or effects, and cause the same to be carried, for the benefit of the owners or proprietors, into port, or to any near adjoining custom house, or other place of safe custody, immediately giving notice thereof to some justice of the peace, magistrate, or custom house or excise officer; or shall discover to such magistrate, or officer, where any such goods or effects are wrongfully bought, sold, or concealed; then *such person or persons shall be entitled to a reasonable reward for such services*, to be paid by the masters or owners of such vessels or goods, and to be adjusted, in case of disagreement about the *quantum*, in like manner as the salvage is to be adjusted and paid, by virtue of a statute made in the 12th of Queen Anne."*

Sect. 6. "And be it farther enacted, that, for the better ascertaining the salvage to be paid in pursuance of the present act, and the act before mentioned, and for the more effectually putting the said act in execution, the justice of the peace, mayor, bailiff, collector of the customs, or chief constable, who shall be nearest to the place where any ship, goods, or effects, shall be stranded or cast away, shall forthwith give public notice for a meeting to be held as soon as possible of the sheriff or his deputy, the justices of the peace, mayors, or other chief magistrates of towns corporate, coroners, or commissioners of the land tax, or any five or more of them, who are hereby empowered and required to give aid in the execution of this and the said former act, and to employ proper persons for the saving of ships in distress, and such ships, vessels, and effects, as shall be

* The act before mentioned.

stranded or cast away; and also to examine persons upon oath, touching or concerning the same, or the salvage thereof, and to adjust the *quantum* of such salvage, and distribute the same among the persons concerned in such salvage, in case of disagreement among the parties or said persons; and that every such magistrate, &c., attending and acting at such meeting shall be paid four shillings a day for his expenses in such attendance out of the goods and effects saved by their care or direction."

Sect. 7. "Provided always, that, if the charges and rewards for salvage directed to be paid by the former statute, and by this act, shall not be fully paid, or sufficient security given for the same, within forty days next after the said services performed, then it shall be lawful for the officer of the customs, concerned in such salvage, to borrow or raise so much money as shall be sufficient to satisfy and pay such charges and rewards, or any part thereof, then remaining unpaid, or not secured as aforesaid, by or upon one or more bill or bills of sale under his hand and seal, of the ship or vessel, or cargo, saved, or such part thereof as shall be sufficient, redeemable upon payment of the principal sum borrowed, and interest upon the same, at the rate of 4*l. per cent. per annum.*

By sect. 9. The commissioners of the land tax, the deputy sheriff, the coroner, and the officers of excise, in each county are declared to be proper officers for putting these acts into execution, together with those persons respectively named in the act of Queen Anne.

By sect. 10. In the Cinque-ports the execution of these acts is intrusted to the lord warden of the Cinque-ports, the lieutenant of Dover castle, the deputy warden of the Cinque-ports, the judge-official and commissary of the Court of Admiralty of the Cinque-ports, two ancient towns, and the members thereof, and to all and every other person and persons appointed, or to be appointed, by the lord warden of the Cinque-ports.

Sect. 11 and 12. Persons convicted of assaulting any magistrate or officer, when in the exercise of his duty respecting the preservation of any ship, vessel, goods, or effects, shall be transported for seven years; and the justices, in the absence of the sheriff, may take a sufficient force with them to repress violence.

Sect. 15. The officer of the customs who shall act in preserving any ship or vessel in distress, or the cargo thereof, shall cause all persons belonging to the said ship, or vessel, and others who can give any account thereof, or of the cargo thereof, to be examined upon oath, before some justice of the peace, as to the name or description of the said ship or vessel, and the names of the master, commander, or chief officer, and owners thereof,

and of the owners of the said cargo, and of the ports or places from or to which the said ship or vessel was bound, and the occasion of the said ship's distress; which examination the justices are to take down in writing, and they shall deliver a true copy thereof, together with a copy of the account of the goods, to the officer of the customs, who shall transmit the same to the secretary of the Admiralty for the time being, that he may publish the same, or so much thereof, in the London Gazette, as shall be necessary for the information of persons interested therein. This act is not to extend to Scotland. These are the regulations for salvage in case of *wreck*.

The salvage payable upon *recapture* has from time to time, been anxiously regulated by acts of parliament. The latest, and of course present, regulations are contained in the 33 Geo. III. c. 66; 48 Geo. III. c. 130; 49 Geo. III. c. 122; and 53 Geo. III. c. 87. By the 33 Geo. III., c. 66, § 42, it is enacted, that, "if any ship, vessel, or boat, taken as prize, or any goods therein, shall appear and be proved, in the court of Admiralty, to have belonged to any of his Majesty's subjects of Great Britain or Ireland, or any of the dominions and territories continuing under his Majesty's protection and obedience, which were before taken by any of his Majesty's enemies, and, *at any time afterwards*, retaken by any of his Majesty's ships of war, or any private man of war, or other ship, vessel, or boat, under his Majesty's protection or obedience, that then such ships, vessels, boats, and goods, and every such part and parts thereof as aforesaid, belonging to such his Majesty's subjects, as shall be adjudged to be restored, and shall be, by decree of the said court of Admiralty, accordingly restored to such former owner or proprietor or proprietors, he or they paying, for and in lieu of salvage, if retaken by any of his Majesty's ships of war, *an eighth part of the true value of the ships, vessels, boats, and goods, respectively so to be restored;* which salvage shall be answered and paid to the captains, officers, and seamen, in the said men of war, to be divided as before in this act is directed: and, if retaken by any privateer, or other ship, vessel or boat, *one sixth part* of the true value of the said ships, vessels, boats, and goods; all which payments, to be made to any privateer, or other ship, vessel, or boat, shall be without any deductions. And, in case of recapture by the joint operations of any of his Majesty's ships and any private ship of war, then the judge of the Court of Admiralty shall order such *salvage* to be paid to the recaptors as he shall deem fit and reasonable, which salvage shall be paid to the agents of the recaptors, in such proportions as the said court shall adjudge. But if such ship, so retaken, shall appear to have been, after the taking by the enemy, by them set forth as a vessel of war, the same shall *not* be restored

to the former owners, but shall be adjudged lawful prize for the benefit of the captors."*

The wearing apparel of the master and seamen are always excepted from the allowance of salvage. *Lex Mercatoria*, 147.

The valuation of a ship, in order to ascertain the rate of salvage, may be determined by the policy of assurance, if there is no reason to suspect she is undervalued: and the same rule may be observed as to goods, where there are policies upon them, if that, however, should not be the case, the salvers may insist upon proof of the *real* value, which may be done by the merchant's invoices, and they must be paid for accordingly. *Lex Mercatoria*, 147.

The assured may recover from the assurer the expenses of salvage, yet, he cannot receive a double satisfaction for the same loss. Thus, if the assurer should have paid to the assured the expenses arising from salvage, and afterwards, on account of some particular circumstance, the loss should be repaired by some unexpected means, the assurer shall stand in the place of the assured, and receive the sum thus paid to atone for the loss. *Randall* v. *Cochran*, 1 Vez. 98.

Cases frequently arise, in which the salvage is so high, the other expenses so great, and the object of the voyage so far defeated, that the assured is allowed to *abandon* his interest in the property saved to the assurer, and to call upon him to contribute as if a total loss had actually happened. This will be treated of in the following division.

IX. *Abandonment.*

The assured, before he can demand a recompense from the underwriter for a *total loss*, must cede or *abandon* to him his right to all the property that may chance to be recovered from shipwreck, capture, or any other peril stated in the policy.

The *right to abandon* must arise upon the object of the assured being so far defeated that it is not worth his while to pursue it: such a loss is equally inconvenient to him as if it had been total. For instance, if the voyage be absolutely lost, or not worth pursuing; if the salvage be very high, *suppose a half:* if farther expense be necessary; if the assurer will not engage at all events to bear that expense, though it should exceed the value, or fail of success: under these and many other like circumstances, the assured may disentangle himself, and abandon, notwithstanding there has been a recapture. 2 Burr. 1209.

* Several defects relative to the adjustment of salvage have been remedied, and new regulations introduced, by the other acts above mentioned, entitled, 'acts for preventing frauds and depredations, by boatmen and others, on merchants, &c.' of which abstracts are given in a subsequent chapter of this work.

There may be circumstances in which it would be unjust to suffer the assured to abandon; for, a ship might be taken and escape immediately, which would be no hindrance at all to the voyage; or she might be taken and instantly ransomed, which would amount only to a partial loss; in which cases, the assured shall not be allowed to demand a recompense for a total loss. 2 Burr. 697. 1213.

The right to abandon must depend upon the nature of the case at the time of the action brought, or at the time of the offer to abandon. Burr. 1214.

The owner, therefore, cannot abandon, unless at *some* period or other of the voyage there has been a total loss; and, therefore if neither the thing assured, nor the voyage, be lost, and the damage sustained shall be found, upon computation, not to amount to a moiety of the value, the owner shall not be allowed to abandon. 1 Term Rep., 191.

These principles will be confirmed by the judgments in the following cases:

In *Pringle* v. *Hartley*, in chancery, 1744, 3 Atk. 125. The defendants had assured the ship *Success* from London to Bermuda, and so to Carolina: the ship was taken by a Spanish privateer, and afterwards retaken by an English privateer, and carried into Boston, in New England, where no person appearing to give security, or to answer the moiety, the recaptors were entitled to for salvage, she was condemned, and sold in the court of admiralty there; the recaptors had their moiety, and the overplus money remained in the hands of the officers of that court.

It was contended for the underwriter that the assured ought not to recover more on the policy than a moiety of the loss, as the act of the 13 Geo. II., c. 4. § 18, gives the thing saved to the owner, as he is entitled to receive it from the officers of the Admiralty; and that the underwriter ought to be obliged to pay no more than the loss actually sustained, which cannot be ascertained till after the assured shall have received the part that might have come to him upon the salvage.

The assured was willing to relinquish his interest to the underwriter in the benefit of the salvage.

Upon this, Lord Chancellor Hardwicke said, "I take it, when the assured is willing to relinquish his interest in the salvage, he ought to recover the whole money assured. It would be mischievous if it were otherwise; for, then, upon a recapture, a man would be in a worse situation than if the ship were totally lost."

Goss and another v. *Withers*, 2 Burr. 683.—This was a special case upon two actions on two distinct policies of assurance: one upon a ship, and the other upon the loading.

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The former was an assurance on the David and Rebecca, at and from Newfoundland to her port of discharge in Portugal or Spain, without the Straits, or England, to commence from the time of her beginning to load at Newfoundland for either of the above named places; and to continue till she should be arrived at her said port of discharge, and there moored 24 hours at anchor, in safety. The ship was, by agreement, to be valued at the sum subscribed, without farther account. The assurance was to be at ten guineas *per cent.*, and in case of loss, to abate two *per cent.*, and, in case of average loss, not exceeding *5l. per cent.*, to allow nothing towards such loss. And, if the vessel was discharged without the Straits, excepting the Bay of Biscay, two guineas *per cent.*, were to be returned; and, if she sailed with convoy, and arrived, two guineas more *per cent.* were to be returned. The plaintiffs declared upon a total loss, by capture of the French.

The policy, declared upon in the other action, was an assurance upon any kinds of lawful goods and merchandises, loaden or to be loaden on board the aforesaid ship: and this policy for *7l. 7s.* assured *70l.* The declaration alleged that, divers quantities of fish and other lawful merchandises, to the value of the money assured, were put on board, to be carried from Newfoundland to her port of destination, and so continued (except such as were thrown over-board, as is after mentioned) till the loss of the ship and goods. The declaration then avers, that a part of the said goods were necessarily thrown over-board in a storm, to preserve the ship and the rest of the cargo; after which jetson, the ship and the remainder of the goods were taken by the French.

The case stated that, the ship departed from her proper port, and was taken by the French on the 23d of December, 1756: and that the master, mates, and all the sailors, except an apprentice and a landman, were taken out and carried to France: that the ship remained in the hands of the enemy *eight days*, and was then retaken by a British privateer, and brought in, on the 18th of January, to Milford-haven, and that immediate notice was given by the assured to the assurer, with an offer to abandon the ship to their care. It was also proved, at the trial, that before the taking by the enemy a violent storm arose at sea, which first separated the ship from her convoy, and afterwards disabled her so far as to render her incapable of proceeding on her destined voyage, without going into port to refit. It was also proved, that part of the cargo was thrown over-board in the storm, and the rest of it was spoiled while the ship lay at Milford-haven, after the offer to abandon, and before she could be refitted: and the assured proved their interest in the ship and cargo to the value assured.

Several questions arising upon the trial of the first of these causes, it was agreed, that the jury should bring in their verdict, in both causes, for the plaintiffs, as for a total loss; subject, however, to the opinion of the court on the following question, viz:

Whether, under the several circumstances of this case, the assured had or had not a right to abandon the ship to the assurers after she was carried into Milford-haven?

The court decided unanimously in favour of the plaintiffs, and Lord Mansfield, in delivering the opinion of the court, made the following observations:

Lord Mansfield.—"The single question upon which this case turns is, whether the assured had, under all the circumstances, an election to abandon, on the 18th of January, 1757? The loss and disability were in their nature total at the time they happened. During eight days, the plaintiff was certainly entitled to be paid by the assurer as for a total loss; and, in case of a recapture, the assurer would have stood in his place. The subsequent recapture is, at best, a saving only of a small part. The disability to pursue the voyage still continued. The master and mariners were prisoners. The charter party was dissolved. The freight (except in proportion to the goods saved) was lost. The ship was necessarily brought into an English port. What could be saved might not be worth the expense necessarily attending it; which is proved by the plaintiff's offer to abandon. The subsequent title to restitution, arising from the recapture, at a great expense: the ship too being disabled from pursuing her voyage, cannot take away a right vested in the assured at the time of the capture. But, because he cannot recover more than he has suffered, he must abandon what may be saved. I cannot find a single book, ancient or modern, which does not say, that, in case of a ship being taken, the assured may demand as for a total loss, and abandon. What proves the proposition most strongly is, that, by the general law, he may abandon, in the case merely of an arrest, or an embargo, by a prince not an enemy.

"No capture by the enemy can be so total a loss, as to leave no possibility of a recovery. If the owner himself should retake at any time, he will be entitled; and, by the late act of parliament, if an English ship retake at any time, before condemnation or after, the owner is entitled to restitution upon stated salvage. This chance does not suspend the demand for a total loss upon the assurer; but justice is done, by putting him in the place of the assured, in case of a recapture. There might be circumstances under which a capture would be but a small temporary hindrance to the voyage, perhaps none at all; as if a ship were taken, and, in a day or two, escaped entire,

and pursued her voyage. There are circumstances under which it would be deemed an average loss: if a ship taken be immediately ransomed, and pursue her voyage, there the money paid is an average loss; and, in all cases, the assured may choose not to abandon. It might as reasonably be argued, that, if a a ship, sunk, were weighed up again at a great expense, the crew having perished, the assured could not abandon, nor the assurer be liable, because the body of the ship was saved. We are therefore of opinion, that the loss was total by the capture, and the right which the owner had, after the voyage was defeated, to obtain restitution of the ship and cargo, paying great salvage to the recaptor, might be abandoned to the assurers, after she was brought to Milford-haven."

The principles laid down in this case have been adhered to in later decisions: in one of which (*Miller* v. *Fletcher*, Douglas's Rep. 219) Lord Mansfield said, that, from the two cases of *Goss* v. *Withers*, just quoted, and *Hamilton* v. *Mendes*, here following, the whole law between assurers and assured, as to the consequence of recapture, might be collected.

Hamilton v. *Mendes*, 2 Burr. 119, and 2 Black. 276.—This was a special case reserved at Guildhall, at the sittings there before Lord Mansfield, after Michaelmas Term, 1760, in an action brought against the defendant, as one of the assurers, upon a policy of assurance from Virginia or Maryland to London, of a ship called the Selby, and of goods and merchandise therein, until she shall have moored at anchor twenty-four hours in good safety. The case stated for the opinion of the court was as follows:

That the ship Selby, mentioned in the policy, being valued at 1200*l.* and the plaintiff having interest therein, caused the policy in question to be made; and the same was accordingly made in the name of John Mackintosh, on behalf and for the use and benefit of the plaintiff, and was subscribed by the defendant as stated, for 100*l.* That the ship was in good safety at Virginia, where she took on board 192 hogsheads of tobacco, to be delivered at London. That, on the 28th day of March, she departed and set sail from Virginia for London; and, on the 6th day of May following, as she was sailing and proceeding on her said voyage, was taken by a French privateer, called the Aurora, of Bayonne. That, at the time of her capture, the Selby had nine men on board; and the captain of the said privateer took out six, besides the captain, leaving only the mate and one man on board. That, the French put a prize master and several men on board the ship Selby, to carry her to France. That, as the French were carrying her towards France, on the 23d day of the said May, she was retaken off Bayonne, by an English man of war, and accordingly sent into Plymouth,

where she arrived the 6th day of June following. That the plaintiff living at Hull, as soon as he was informed what had befallen his ship, the Selby, wrote a letter, on the 23d of June, to his agent, John Mackintosh, living in London, to acquaint the defendant, "that the plaintiff did from thence abandon to him his interest in the said ship, as to the said 100*l*. by the defendant assured." That the said J. M., on the 26th of June, acquainted the defendant with the offer to abandon the ship; to which the defendant answered, "that he did not think himself bound to take the ship; but was ready to pay the salvage, and all other losses and charges the plaintiff sustained by the capture." That, upon the 19th day of August, the ship Selby was brought into the port of London, by order of the owners of the cargo and the recaptors: that the ship Selby sustained no damage from the capture. That the whole cargo of the said ship was delivered to the freighters, at the port of London, who paid the freight to Benjamin Vaughan, without prejudice. The question, therefore, submitted to the court is, whether the plaintiff, on the said 25th day of June, had a right to abandon, and has a right to recover, as for a total loss?

Lord Mansfield.—"The plaintiff has averred in his declaration, as the basis of his demand for a total loss, *that by the capture the ship became wholly lost to him.* The general question is, whether the plaintiff, who, at the time of his action brought, at the time of his offer to abandon, and at the time of his being first apprised of any accident having happened, had only, in truth, sustained a partial loss, ought to recover for a total one.

"The plaintiff's demand is for an indemnity. This action then must be founded upon the nature of his damnification, as it really is, at the time the action is brought. It is repugnant, upon a contract of indemnity, to recover as for a total loss, when the final event has decided that the damnification, in truth, is an average, or perhaps no loss at all. Whatever undoes the damnification, in whole or in part, must operate upon the indemnity in the same degree. It is a contradiction in terms, to bring an action for indemnity, when, upon the whole event, no damage has been sustained.

"In the present case, the notion of a vested right in the plaintiff to sue as for a total loss, before the recapture, is fictitious only, and not founded in truth. For, the assured is not *obliged* to abandon in any case; he has an election. No right can vest as for a total loss till he has made that election: he cannot elect, before advice is received of the loss; and, if that advice show the peril to be over and the thing in safety, he cannot elect at all, because he has no right to abandon when the thing is safe. The present attempt is the first that ever was made to charge

the assurer as for a total loss, upon an interest policy, after the thing was recovered.

"It has been said, 'that there is no book, ancient or modern, which does not say, that, in case of the ship being taken, the assured may demand for a total loss, and abandon.' That proposition is certainly true, provided the capture, or the total loss occasioned thereby, continue to the time of abandoning and bringing the action. It is impossible that any man should desire to abandon in a case circumstanced like the present, but for one or two reasons, namely, either because he has *overvalued*, or because the *market has fallen below the original price.* The only reasons that can make it the interest of the party to desire, are conclusive against allowing it. It is unjust to turn the fall of the market upon the assurer, who has no concern in it, and could never gain by the rise. And an overvaluation is contrary to the general policy of the marine law; contrary to the spirit of the act of 19 Geo. II., a temptation to fraud, and a great abuse: therefore no man shall be allowed to avail himself of having overvalued. If the valuation be true, the plaintiff is indemnified by being paid the charge he was put to by the capture. If he has overvalued, he will be a gainer, if he be permitted to abandon; and he can only desire it because he has overvalued. To obviate too large an inference being drawn from this determination, I desire it may be understood, that the point here determined is, 'that the plaintiff, upon a policy, can only recover an indemnity, according to the nature of his case, at the time of the action brought, or (at most) at the time of his offer to abandon.' We give no opinion how it would be, in case the ship or goods were restored in safety, between the offer to abandon and the action brought, or between the commencement of the action and the verdict. And particularly I desire, that no inference may be drawn, 'that, in case the ship or goods should be restored after the money paid as for a total loss, the assurer could compel the assured to refund the money, and to take the ship or goods;' that case is totally different from the present, and depends, throughout, upon different reasons and principles. Here the event had fixed the loss to be an average only, before action brought, before the offer to abandon, and before the plaintiff had notice of any accident, consequently, before he could make an election. We are therefore of opinion that he cannot recover for a total, but for a partial loss only, the quantity of which has been estimated by the jury at ten pounds *per cent.*"

But, though the court did not choose unnecessarily to decide whether, after payment as for a total loss, the underwriter could oblige the assured to refund, if it should afterwards prove to be but partial; yet, in the year 1766, this very question came be-

fore them. It arose in the case of *Da Costa* v. *Frith*, 4 Burr. 1966; and the court held, that as there was a solemn abandonment, and the money was paid, and as there was also an agreement that the assurers should be content with such salvage as the sum assured bore to the whole interest, the assured should not be obliged to refund, but the assurer should stand in his place for the salvage.

Cazalet and others v. *St. Barbe*, 1 Term Rep., p. 187.—This was an action on a policy of assurance upon the ship Friendship, from Wyburg to Lynn, subscribed by the defendant for 100*l.* at two guineas *per cent.* The defendant pleaded a tender, and paid 48*l.* into the court. The cause was tried at Guildhall before Mr. Justice Buller, when a case was reserved for the opinion of the court, stating, that the *damage sustained by the ship, in the voyage assured, did not exceed* 48*l. per cent.*, which sum the defendant had paid into court upon pleading in the action. That, when the ship arrived at the port of Lynn, she was not worth repairing. The question for the opinion of the court was, whether the plaintiff had a right to abandon.

This case came on to be argued when Lord Mansfield was absent, and the three other judges were unanimous in opinion for the defendant.

Mr. Justice Buller said, "nothing can be better established than that the owner of a ship can only abandon in case of a total loss. But *there is no instance where the owner can abandon unless, at some period or other of the voyage, there has been a total loss.* No such event has happened here; for the jury have expressly found that the loss amounted only to 48*l.* per cent. Even allowing *total loss* to be a technical expression, yet the manner, in which the plaintiff's counsel has stated it, is rather too broad. It has been said, that the assurance must be taken to be on board of the ship as well as on the voyage: but the true way of considering it is this, *it is an assurance on the ship for the voyage.* If either the ship or the voyage be lost, that is a total loss; but here neither is lost."

In another case, an action was brought on a policy of assurance on the Prince of Wales, in port or at sea. for six months, from the 18th of July, 1777. The ship in question was in government service, bound from Cork to Quebec. She arrived there; but, the season being too far advanced before she was ready to return, she was removed into the basin; but, on the 19th of November, she was driven thence by a field of ice, and damaged by running on the rocks. The condition of the ship could not be examined till April following, after the expiration of the policy. She was then, however, found to be bulged, and much injured, but not thought irreparably so. In the progress of the repair, difficulties arose from want of materials; and the

captain, after consulting the merchants and agents in the country, sold her. An account was made up, charging the assurers with the whole amount, and crediting them with the sums for which the ship sold, as salvage.

Lord Mansfield, at the trial, said, "the great point in the cause is, whether this is a total loss by this accident. It is a new question, upon which I shall reserve a case for the opinion of the court." After argument by counsel on both sides, his Lordship said, "the justice of the case seemed to be, that the loss in November should be taken as an *average* not a *total* one: and that the whole court were of opinion, that the ship should be considered as damaged on the 19th of November, but not *totally lost.*" *Ferneaux* v. *Bradley;* Easter Term, 20 Geo. III.

In a case before Lord Kenyon, *M'Masters* v. *Shoolbred;* sittings after Michaelmas, 35 Geo. III., Espinasse's Cases, p. 237, he held, the action being on a policy for six months, and the ship having been captured and carried into Charlestown, sold by the captors, *by the authority of the French consul there,* and purchased by the captain for account of the original owners, that this was only a partial loss, and that the owners could not abandon. His Lordship was of opinion, that the captain was agent for the owners; and that, he having recovered the vessel upon their account, and having paid a kind of salvage, (the amount of which would be the loss sustained,) it only constituted an average loss. At the time the ship was captured and carried into port, in the enemy's possession, the assured at that time might have abandoned. But not having done so till the vessel was recovered, they could now go only for an average loss. Upon the trial of this cause, it did not occur to the defendant to make objection, that the act of the French consul was illegal, and that, consequently, the money paid by the original owners *was in the nature of a ransom.* This objection was made, however, and admitted to prevail, in a subsequent case, (*Havelock* v. *Rockwood,*) which is fully detailed in a former part of this work, under the head of losses by "CAPTURE AND DETENTION OF PRINCES."

Although almost all these cases of abandonment were after a *capture,* yet many of the rules there laid down were general in their nature, comprehending cases of *wreck* and *detention,* as well as capture. This will be best explained, by putting the two following possible cases:

Suppose a neutral ship be arrested and detained by a foreign prince by an *embargo,* the owner immediately, upon hearing this accident, would have a right to abandon; because no man is bound to wait the event of an embargo. But if the same ship that brings the account of the embargo, should also inform him that the embargo was taken off, that the ship had only been de-

tained two or three days, that very trifling damage had arisen, then it is impossible to say that the merchant may abandon; because, as we have seen, it is a principle of good sense, that a man cannot make his election, whether he will abandon or not, till he receive advice of the loss; and if, by the same conveyance, it appear that the peril is over, and the thing assured be in safety, he has lost his election entirely; because he has, and can have, no right to abandon when his property is safe.

The same principle governs in the case of *wreck;* for, let us suppose a trunk of bullion, as in the case of *Da Costa* v. *Frith*, to be the property assured; and that, the ship being wrecked, this trunk, of course, goes to the bottom; the owners would instantly be entitled to abandon to the underwriter, and call upon him to contribute, as in the case of a total loss. But, if it should so happen that, before the action was brought, or before the offer was made to abandon, the bullion should be recovered and restored to the owner, at the place of destination, upon paying a moderate salvage; in that case, it would fall within the rule of *Hamilton* v. *Mendes;* and the assured would only be entitled to recover an indemnity, according to the nature of the case, at the time when the action was brought; and, consequently, he would not be allowed to abandon.

If, on account of a hostile embargo, the assured abandon both ship and freight to the underwriter, and the ship afterwards earn freight on the embargo's being taken off, the underwriters are not bound to pay for a total loss of freight; although they have accepted the previous abandonment; since the freight has in fact been earned.—*M'Carthy and others* v. *Abel;* Term Rep. Trinity, 44 Geo. III.

It has been settled, by a solemn decision of the court of King's Bench, in *Manning* v. *Newnham*, Trin. 22 Geo. III., in what cases a loss should be deemed to be total, after an accident by perils of sea. A policy was effected in London upon the ship Grace, her "*cargo and freight*, at and from Tortola to London, warranted to depart on or before the first of August, 1781. The ship valued at 2470*l.* the freight at 2250*l.* and the cargo at 12400*l.* at a premium of 25 guineas *per cent.* to return 10*l. per cent.* if she departed the West Indies with a convoy for England, and arrives." At the head of the subscriptions is the following declaration, viz. *On the ship, freight, and goods, warranted free of particular average.* This ship, with her cargo, was a Dutch prize taken by a privateer off Tortola, and was condemned; during the whole of her stay at Tortola (four or five months) she was never unloaded. On the first of August, the whole fleet of merchantmen got under weigh under convoy of the Cyclops, &c., but, not being able to get clear of the islands that day, they cast anchor during the night, and the

next day got clear of the islands. About ten o'clock on the 2d of August, several squalls of wind arose, which occasioned the ship to strain and make water so fast, that the crew were obliged to work both pumps; and on the third the captain made a signal of distress: in consequence of which she was obliged to return to Tortola, under the protection of one of his Majesty's ships. The captain made his protest, and a survey was had, by which the ship was declared unable to proceed with her cargo, and that she could not be repaired in any of the English islands in the West Indies: and that many of the sugars in the bilge and lower tier were washed out, and several of the casks broke and in bad order. The ship and the whole of the cargo were sold at Tortola accordingly. The assured claimed a total loss of ship, cargo, and freight, which the jury thought right, and found accordingly. A motion was made for a new trial, which, upon full consideraton, was refused.

Lord Mansfield, after stating the evidence, and that his prejudices at the trial were in favor of the underwriters, proceeded thus: "But notwithstanding this inclination of my opinion, upon full consideration, we think the jury have done right. If by a peril assured the voyage is lost, it is a total loss: otherwise not. In this case the ship has irreparable hurt within the policy. This drives her back to Tortola, and there is no ship to be had there which could take the whole cargo on board. There were only two ships at Tortola, and both could not take in the cargo. To show how completely the voyage was lost, that no ship could be got, the assured have not been able to send that part of the goods, which they purchased, forward to London. It is admitted there was a total loss on the freight, because the ship could not perform her voyage. The same argument applies to the ship and cargo. It is a contract of indemnity; and the assurance is, that the ship shall come to London. Upon turning it in every view, we are of opinion that the voyage was totally lost, and that this is the ground of our determination."

From what has been said in the preceding part of this subject it appears, that the assured has a right to call upon the underwriters for a total loss, and of course to abandon, as *soon as he hears* of such a calamity having happened, his claim to an indemnity not being at all suspended by the chance of a future recovery of part of the property lost: because, by the abandonment, that chance devolves upon the underwriter, by which means the intention of the contracting parties is fully answered, and complete justice is done.

In a modern decision it has been held by the Court of King's Bench, that, as soon as the assured receive account of such a loss as entitles them to abandon, they must, *in the first instance*,

make their election whether they will abandon or not: and, if they abandon, they must give the underwriters notice in a reasonable time, otherwise they waive their right to abandon, and can never afterwards recover for a total loss. *Mitchell* v. *Edie*, 1 Term Rep. 608.

The doctrine has been since acted upon in a case before Lord Kenyon; *Atwood* v. *Henckell*, sittings at Guildhall after Michaelmas, 1795.

But if the assured, hearing that his ship is much disabled, and has put into port to repair, express his desire to the underwriters to abandon, and be dissuaded from it by them, and they order the repairs to be made; they are liable to the owner for all the subsequent damage occasioned by that refusal, though it should amount to the whole sum assured. *Da Costa* v. *Newnham*, 2 Term Rep. 407.

X. *Fraud in Policies.*

The assurers and assured are equally bound to disclose circumstances that are within their knowledge; and therefore, if the assurer, at the time he underwrites, can be proved to have known that the ship was safe arrived, the contract will be equally void as if the assured had concealed from him some accident which had befallen the ship.

It is necessary to consider this in three divisions: 1*st*. *The allegations of any circumstances, as facts, to the underwriter, which the person assured knows to be false: 2dly. The suppression of any circumstances which the assured knows to exist; and which, if known to the underwriter, might prevent him from undertaking the risk at all, or, if he did, might entitle him to demand a larger premium: and, lastly, a misrepresentation.* Of each of these in order.

In a case before Lord Chief Justice Holt, in the reign of William and Mary, that learned judge held, that, if the goods were assured as the goods of a Hamburger, who was an ally, and the goods were, in fact, the goods of a Frenchman, who was an enemy, it was a fraud, and that the assurance was not good. Skinner, 327.

In another case, a letter being received, stating that a ship sailed from Jamaica to London on the 24th of November, after which an assurance was made, and the agent told the assurer, that the ship sailed the latter end of December; this was held by Lord Chief Justice Lee, to be a fraud, and the defendant had a verdict. *Robarts* v. *Fonnereau:* sittings after Trin. Term, 1742.

And, in another case, where the policy was underwritten thus, "Warranted neutral ship and property:" and the jury found "that the ship and property were not neutral property,

as warranted by the said policy;" Lord Mansfield and the rest of the court were of opinion that it was too clear a case to bear an argument. This was *no contract;* for there was a falsehood in respect to the condition of the thing assured; because the plaintiff assured neutral property, and this was not neutral property.—*Woolmer* v. *Muilman*, 3 Burr. 1419.—*Fernandez* v. *Da Costa;* sittings after Hilary, 4 Geo. III.

From the preceding case, we may collect this principle, that a *false assertion* in a policy will vitiate the contract; even though the loss happen in a mode *not* effected by that falsity.

The second species of fraud, which affects assurances, is *the concealment of circumstances known only to one of the parties entering into the contract.* The facts, upon which the risk is to be computed, lie, for the most part, within the knowledge of the assured only. The underwriter must therefore rely upon him for all necessary information; and must trust to him, that he will conceal nothing, so as to make him form a wrong estimate. If a mistake happen, without any fraudulent intention, still the contract is annulled, because the risk is not the same which the underwriter intended.

One having a doubtful account of his ship, that was at sea, namely, that a ship, described like his, was taken, assured her, without giving any notice to the assurers of what he had heard, either as to the hazard or the circumstances, which might induce him to believe that his ship was in great danger, if not actually lost. Lord Chancellor Macclesfield.—"The assured has not dealt fairly with the assurers in this case; he ought to have disclosed to them what intelligence he had of the ship's being in danger, and which might induce him, at least, to fear, that it was lost, though he had no certain account of it, for, if this circumstance had been discovered, it is impossible to think that the assurers would have assured the ship at so small a premium as they have done, but either would not have assured at all, or would have insisted on a larger premium, so that the concealment of this intelligence is a fraud." Whereupon the policy was decreed to be delivered up with costs; but the premium to be paid back and allowed out of the costs.—*Da Costa* v. *Seanaret*, 2 Peere Williams, 170.

In another case it appeared, that, on the 25th of August, 1740, the defendant underwrote a policy from Carolina to Holland. It came out in evidence that the agent for the plaintiff had, on the 23d of August (two days before the policy was effected,) received a letter from Cowes, dated the 21st of August, wherein it is said; "On the 12th of this month I was in company with the ship Davy; (the ship in question) at twelve at night lost sight of her all at once: the captain spoke to me the day before that she was leaky; and the next day we had a

hard gale." The ship, however, continued her voyage till the 19th of August, when she was taken by the Spaniards; and there was no pretence of any knowledge of the actual loss at the time of the assurance; but it was made in consequence of a letter received that day from the plaintiff abroad, dated the 27th of June before. Lord Chief Justice Lee declared, that, as these are contracts upon chance, each party ought to know all the circumstances. And he thought it not material that the loss was not such a one as the letter imported: for, those things are to be considered in the situation of them at the time of the contract, and not to be judged of by subsequent events. He therefore thought it a strong case for the defendant. The jury found accordingly.—*Seaman* v. *Fonnereau*, 2 Stra. 1183.

In an action on a policy of assurance, the case was, that the ship was assured *at and from* Genoa, liable to average. The loading was put on board *at* Leghorn the 10th of August, and the vessel had lain at Genoa above five months, being originally bound for Dublin; but, losing her convoy, she put into Genoa the 13th of August, and lay there till the 5th of January, when she sailed. And the assurance was made the 20th of January; at which time these circumstances were known to the assured, but not communicated to the underwriter. A few days after she put to sea, she was shattered by a storm, and the cargo considerably damaged. The jury found a verdict for the plaintiff; and a new trial was moved for on this ground, that the policy was bad *ab initio*, from want of a due disclosure of the circumstances.

Lord Mansfield.—"The question is, whether here was a sufficient disclosure; that is, whether the fact concealed was material to the risk run. This is a matter of fact, and if material, the consequence is matter of law, that the policy is bad. Now who can say that no risk was run, during the five months' stay at Genoa, or no damage happened in that period? The policy is founded on misrepresentation; the ship is assured 'at and from Genoa to Dublin; the adventure to begin from the loading, to equip for this voyage.' This plainly implies that Genoa was the port of loading; and, at the trial, all the witnesses said, that, by usage, it was material to acquaint the underwriter, whether the assurance was to be at the commencement or in the middle of the voyage." A new trial was accordingly granted. *Hodgson* v. *Richardson*, 1 Blackst. Rep. 463.

The case of *Grieve* v. *Young*, decided by the court of session in Scotland, in 1782, is correspondent in principle with these decisions. A letter was sent by the owner of a ship to his correspondent in Edinburg, to make an assurance on her. After the letter was put into the post, but before the post departed, the ship was lost; and was known to be so by the said owner.

He did not write to countermand the assurance, as he might have done, by *the same post*, in which ease the assurance could not have been effected. The court were of opinion, that it was not incumbent on the owner to countermand it by *an express*, but being satisfied that there was time for so doing by the *ordinary course* of the post, and which was his duty to do, gave judgment for the underwriters.

But although the rule is laid down thus generally, that one of the contracting parties is bound to conceal nothing from the other, yet it is by no means so general as not to admit of an exception. There are many matters as to what the assured may be innocently silent.

Our ideas on this topic, the argument of Lord Mansfield, in *Carter* v. *Boehm*, 3 Burr. 1905, will completely regulate. The facts of that case are not material; but we shall only give the reasoning of Lord Mansfield upon the general doctrine of what is not necessary to be revealed.

His Lordship said, "Assurance is a contract upon speculation. The special facts, upon which the risk is to be computed, lie most commonly in the knowledge of the assured only. The underwriter trusts to his statement, and proceeds upon confidence, that he does not keep back any circumstances within his knowledge, to mislead the underwriter into a belief that the circumstance does not exist, and to induce him to estimate the risk as if it did not exist. The keeping back such circumstance is a fraud, and therefore the policy is void. Although the suppression should happen through mistake, without any fraudulent intention, yet still the underwriter is deceived, and the policy is void; because the risk run is really different from the risk understood and intended to be run at the time of the agreement. The policy would be equally void against the underwriter, if he concealed any thing; as, if he assured a ship on her voyage, which he privately knew to be arrived; and an action would lie to recover the premium. The governing principle is applicable to all contracts and dealings. Good faith forbids either party, by concealing what he privately knows, to draw the other into a bargain, from his ignorance of that fact, and his believing the contrary. But either party may be innocently silent as to grounds open to both to exercise their judgment upon. There are many matters as to which the assured may be innocently silent; he need not mention what the underwriter knows. An underwriter cannot insist that the policy is void, because the assured did not tell him what he actually knew, what way soever he came to the knowledge. The assured needs not mention what the underwriter ought to know; what he takes upon himself the knowledge of; or what he waives being informed of. The underwriter needs not to be told what lessens the

risk agreed, and understood to be run by the express terms of the policy. He needs not be told general topics of speculation: as, for instance, the underwriter is bound to know every cause which may occasion natural perils; as the difficulty of the voyage, the kind of season, the probability of lightning, hurricanes, and earthquakes. He is bound to know every cause which may occasion political perils, from the rupture of states, from war, and the various operations of war. He is bound to know the probability of safety, from the continuance and return of peace; from the imbecility of the enemy, through the weakness of their councils or their want of strength. If an underwriter assures private ships of war, by sea and on shore, from ports to ports, and from places to places, any where, he needs not be told the secret enterprizes upon which they are destined; because he knows some expedition must be in view; and, from the nature of his contract, he waives the information, without being told. If he assure for three years, he need not be told any circumstance to show that it may be over in two: or, if he assure a voyage with liberty of deviation, he need not be told what tends to show there will be no deviation. Men argue differently, from natural phenomena and political appearances: they have different capacities, different degrees of knowledge, and different intelligence. But the means of information and judging are open to both: each professes to act from his own skill and sagacity, and therefore neither needs to communicate to the other. The reason of the rule, which obliges the parties to disclose, is to prevent fraud and encourage good faith; it is adapted to such facts as vary the nature of the contract, which one privately knows, and the other is ignorant of, and has no reason to suspect. The question, therefore, must always be, "Whether there was, under all the circumstances, at the time the policy was underwritten, a fair statement, or concealment: fraudulent, if designed; or, though not designed, varying materially the object of the policy, and changing the risk understood to be run."

If the assured is bound to disclose fairly all circumstances that may affect the risk, still more strongly is he called upon not to change the condition of his ship against the consent of the underwriter. Thus, in an assurance upon a ship and cargo, from Liverpool to Oporto, the ship sailed, but was driven back by contrary winds; and, before she could sail again, an embargo was laid. The assured applied to the underwriters for leave to put guns on board, and to take out a letter of marque. The underwriters consented to the guns for her defence, but refused the letter of marque. Notwithstanding which, a general letter of marque was obtained, and put on board; the ship sailed, and was taken on her voyage out. The jury thought that the

letter of marque was intended to be used only in the voyage home. The court, however, determined that this vacated the policy.—*Dennison* v. *Modigliani;* 5 Term Rep., K. B., 580, Easter, 1794.

3d. We now come to the third division, namely, to cases in which policies are void by *misrepresentation.* Before we proceed to state the cases under this head, it will be proper to distinguish between a *warranty* and a *representation.* A warranty or condition is that which makes a part of the written policy, and must be more literally and strictly performed; and, being a part of the agreement, nothing *tantamount* will do or answer the purpose. A representation is a statement in the case, not a part of the written instrument, but collateral to it, and entirely independent of it; and it is sufficient, that a representation be *substantially* performed. Warranties will be noticed hereafter. If there be a misrepresentation, it will avoid the policy, as a fraud, but not as a part of the agreement. Even written instructions, if they are not inserted in the policy, are only to be considered as representations; and, in order to make them valid and binding, as a warranty, it is absolutely necessary to make them a part of the instrument, by which the contract of indemnity is effected. If a representation be false in any material point it will avoid the policy; and, if the point be not material, the representation can hardly ever be fraudulent. A few of the decisions will elucidate these principles.

Pawson v. *Watson;* Cowper, 785.—Upon a rule to show cause why a new trial should not be granted in this case, Lord Mansfield reported as follows: This was an action upon a policy of assurance. At the trial it appeared in evidence, that the first underwriter had these instructions shown to him: 'Three thousand five hundred pounds upon the ship Julius Cæsar, for Halifax, to touch at Plymouth, and any port in America; *she mounts twelve guns and twenty men.*' These instructions were not asked for, nor communicated to the defendant; but the ship was only represented *generally to him as a ship of force:* and a thousand pounds had been done, before the defendant underwrote any thing upon her. The instructions were dated the 29th of June, 1776, and the ship sailed on the 23d of July, 1776; and was taken by an American privateer. That, at the time of her being taken, she had on board six four-pounders, four three-pounders, three one-pounders, six half-pounders, which are called swivels, and twenty-seven men and boys in all, for the crew, but of them sixteen only were *men* (not twenty, as the instructions mentioned) and the rest boys. But the witness said, he considered her as being stronger with this force, than if she had twelve carriage guns and twenty men: he also said (which is a material circumstance) that *there were*

neither men nor guns on board at the time of the assurance. That he himself assured at the same premium without regard or inquiry into the force of the ship. Other underwriters also assured at the same premium, without any other representation than that she was *a ship of force.* That to every four-pounder there should be five men and a boy. That, in merchant ships, boys always go under the denomination of men. This was met by evidence on the part of the defendant, saying, that guns mean *carriage guns*, not *swivels;* and men mean *able men*, exclusive of *boys*. The defence was that, these instructions were to be considered as a warranty, the same as if they had been inserted in the policy, though they were not proved to have been shown to any but the first underwriter. If the court should be of opinion that the instructions amounted to a warranty, then a new trial is to be had without costs, otherwise, the verdict, which is for the plaintiff, is to stand.

Lord Mansfield.—" There is no distinction better known to those who are at all conversant in the law of assurance, than that which exists between *warranty*, or condition, which makes a part of a written policy, and a representation of the state of the case. Where it is a part of the written policy, it must be performed. As, if there be a warranty of convoys, there must be a *convoy;* for in case of the convoy, it might be said, the party would not have assured without convoy. Therefore, if there be a fraud in a representation, it will avoid the policy on account of the non-compliance with any part of the agreement. So that there cannot be a clearer distinction, than that which exists between a warranty, which makes part of the written policy, and a collateral representation, which, if false in a point of *materiality*, makes the policy void, but, if *not* material, it can hardly ever be fraudulent. I have repeatedly, at Guildhall, cautioned and recommended it to the brokers, to enter all representations made by them in a book; that advice has been followed in London. The question then is, whether, in this policy, the person assuring has *warranted* that the ship would positively and literally have *twelve carriage guns, and twenty men.* That is, whether the instructions given in evidence are a part of the policy. The answer to this is, read your argument; read your policy. There is no such thing to be found there. It is replied, yes, but in fact there is, for the instructions upon which this policy was made, contain that express stipulation. The answer again is, there never were any instructions shown to the defendant, nor were any asked for by him.

" What colour then has he to say that those instructions are any part of *his* agreement? It is said, he assured upon the credit of the first underwriter. A representation to the first underwriter has nothing to do with that, which is the agreement

or terms of the policy. The representation amounts to no more than this: I tell you what the force will be, because it is so much the better for you. There is no fraud in it, because it is a representation only of what, in the then state of the ship, they thought would be the truth. And in real truth the ship sailed with a larger force; for, she had nine carriage guns and six swivels. The underwriters therefore had the advantage by the difference. There was no stipulation about what the weight of metal would be. All the witnesses say, that she had more force than if she had twelve carriage guns, in point of strength, of convenience, and for the purpose of resistance. The supercargo in particular says 'he assured the same ship, and the same voyage, for the same premium, without saying a syllable about the force.' Why then it was a matter proper for the jury to say, whether the representation was false, or whether it was in fact an assurance as of a ship without force. They have determined, and I think very rightly, that it was an assurance without force, and therefore there can be no new trial."

His Lordship was afterwards asked whether it was the opinion of the court, that to make written instructions valid and binding as a warranty, they must be inserted in the policy. Lord Mansfield answered, "that most undoubtedly that was the opinion of the court; if a man warrant that a ship should depart with twelve guns, and it depart with ten only, it is contrary to the condition of the policy."

If a representation be made to the underwriter of any circumstance which was false, this, if it be in a material point, shall vacate the policy, and annul the contract, although it happens by mistake, and without any fraudulent intention, or improper motive, on the part of the assured. The principle on which, in such a case, the contract is held to be void, is, that the assurer is led into error, and computes his risk upon circumstances not founded in fact; by which means the risk actually run is different from that intended to be run, at the time the contract is made. On this ground it is, that the contract is as much at an end as if there had been a wilful and false allegation, or an undue concealment of circumstances.

Macdowall v. *Frazer;* Doug., 247.—This was an action on a policy of assurance on the ship, "the Mary and Hannah, from New York to Philadelphia." At the time when the assurance was made, which was in London, the 30th of January, the broker represented the situation of the ship to the underwriters as follows: "the Mary and Hannah, a tight vessel, sailed with several armed ships, and was seen safe in the *Delaware on the 11th of December*, by a ship which arrived at New York." In fact, the ship was lost on *the 9th of December*, by running against *a chevaux de frise*, placed across the river. The cause came on

to be tried before Lord Mansfield at Guildhall. This was held to be a material misrepresentation as to the time when the ship was seen; and the representation and the day of the loss being proved, the jury found for the defendant.

In a subsequent case, Lord Mansfield and the rest of the court were clearly of opinion, that if the broker, at the time when the policy is effected, in representing to the underwriter the state of the ship, and the last intelligence concerning her, does not disclose the whole, and what he *conceals* shall appear *material* to the jury, they ought to find for the underwriter, the contract in such case being void; although the concealment should have been *innocent*, the facts not mentioned having appeared *immaterial* to the broker, and having not been communicated merely on that account. *Shirley* v. *Wilkinson;* Doug. Rep., 293.

In order to vitiate the contract, the thing concealed must be *material*, it must be *some fact*, and not merely a supposition or speculation of the assured; and the underwriter must take advantage of any misrepresentation the first opportunity, otherwise he will not be allowed to claim any benefit from it at a future period. If therefore the assured merely represent that he *expects* a thing to be done, the contract will not be void, although the event should turn out very different from his expectation. *Barber* v. *Fletcher;* Doug., 292.

Thus, upon a motion for a new trial, one of the grounds stated to induce the court to grant it was, that since the trial, a material representation, which had been made to Shulbred, the first underwriter upon the policy, and which turned out to be false, had been discovered. Shulbred made an affidavit, by which it appeared, that when he signed the policy, in March, 1788, the broker was getting several others, in other ships, subscribed at the same time, all belonging to the same owner, and said, speaking of them all—"which vessels are *expected* to leave the coast of Africa in November or December, 1777." In truth the vessel in question had sailed in May, 1777, and Shulbred swore, that if he had known that circumstance, he would not have signed. There had been actions brought against all the underwriters on the policy, except Shulbred. A new trial was refused.

Wherever there has been an allegation of a falsehood, a concealment of circumstances, or a misrepresentation, it is immaterial whether such allegation or concealment be the act of the person himself who is interested, or of his agent, or whether it arise from inattention or negligence; for, in either case, the contract is founded in deception, and the policy is consequently void. *Fitzherbert* v. *Mather;* 1 Term Rep., p. 12.

If the assured is supposed to be guilty of fraud, the proof of

it falls upon the underwriter; direct and positive proof is not necessary; but, circumstantial evidence is all that can be expected, and, indeed, all that is necessary to substantiate such a charge.

It remains to be considered, how far the assurer may retain the premium or is bound to return it, in cases where the policy is void, on account of the frauds which have been treated of in this division. This question was decided in the case of *Chapman and others*, assignees of *Kennet* v. *Frazer*, where it was expressly determined, that, in cases of *actual* fraud on the part of the assured or his agent, the underwriter might retain the premium. Hence, too, it would seem, that the underwriter is bound to return the premium, where *fraud* is rather by the construction of the law, than by the actual conduct of the assured. Trinity Term, K. B., 33 Geo. III.

So, if an underwriter be guilty of concealment or fraud, he is liable to return the premium; as if he assure a ship on her voyage, which he privately knew to be arrived. 3 Burr., 1909.

XI. *Sea-Worthiness.*

Every ship assured must, at the time of the assurance, be able to perform the voyage, unless some external accident should happen; and, if she have a latent defect, though wholly *unknown* to the parties, that will vacate the contract; and the assurers are discharged. This doctrine is founded upon that general principle of assurance law, that the assurers shall not be responsible for any loss arising from the insufficient or defective quality or condition of the thing assured.

But, although the assured ought to know whether the ship was sea-worthy or not at the time she set out upon her voyage, yet he may not be able to know the condition she may be in after she is out a twelve-month; and, therefore, whenever it can be made appear, the decay, to which the loss is attributable, did not commence till a period subsequent to the assurance, as she was sea-worthy at the time, the underwriter would be liable. In a late case, *Eden* v. *Parkinson*, Doug. 708, the same principle was much relied upon. Lord Mansfield said, "By an implied warranty, every ship assured must be tight, staunch, and strong; but, it is sufficient if she be so at the time of her sailing. She may cease to be so in twenty-four hours after departure, and yet the underwriter will continue liable."*—Every case of

* If a ship sail upon a voyage, and in a day or two become leaky, and founder; or be obliged to return to port, without any storm, or visible or adequate cause to produce such an effect; the presumption is, that she was not sea-worthy when she sailed; and the jury, without any evidence on the part of the defendant, may draw such a conclusion.—*Monro* v. *Vandam*; sittings before Lord Kenyon, Mich. 1794.

this kind, it is true, must depend upon its own circumstances: but, when they are once ascertained, the rule of law is clear and decisive.

Sea-worthiness being an implied condition in the contract of assurance, it is not necessary there should be any previous representation of the condition of the ship unless particularly called for, because, unless it be fit for the performance of the voyage assured, there is no binding contract. *Shulbred* v. *Nutt*; sittings at Guildhall after Hilary, 1782. *Haywood and another* v. *Rodger*; Term Rep., Hilary, 44 Geo. III.

If it be necessary that the ship itself should be sufficient for the voyage, it is also an implied condition, that she should be furnished with every thing necessary for the purpose of safe and careful navigation. Not only must the ship herself be sea-worthy, but she must have a sufficient crew, a captain of competent skill, and *a pilot on board*, wherever a pilot is customarily employed. *Law* v. *Hollingsworth*; 7 Term Rep., 160.

The ship Indian sailed from Liverpool to the coast of Africa, and thence to the West Indies and America. She arrived at Demerary a mere wreck, owing to a concussion resembling an earthquake, and foundered before she reached shore. The slaves were profitably sold; and the plaintiff recovered, as for a total loss. A rule was obtained, calling on the plaintiff to show cause, why a new trial should not be had, on the grounds that the subject matter of the assurance was considerably deteriorated on the ship's arrival. It was, however, held that this argument was of no weight, and the rule was discharged. Term Rep., Mich. 42 Geo. III. *Shawe* v. *Felton*.

XII. *Illegal Voyages.*

Whenever an assurance is made upon a voyage expressly prohibited by the common statute, or maritime law of the country, the policy is of no effect, being void from the beginning.

Even if it be told to the underwriter, that the voyage is illicit, he shall not be bound, because the contract is null and void.—Bynk. Quæst. Jur. Pub., l. i., c. 21.

If a ship, though neutral, be assured on a voyage prohibited by an embargo, laid on *in time of war*, by the prince of the country in whose ports the ship happens to be, such an assurance is also void.—1 Black. Com., 270.

It follows, of course, that any act done in contravention of a proclamation of this nature, is illegal and criminal; because it is equally binding as an act of parliament, and a contract founded on such illicit proceedings is consequently void. *Delmuda* v. *Motteux*; Mich. 25 Geo. III.

Though an assurance upon a smuggling voyage, prohibited

by the revenue laws of this country, would be void under the principle above stated; yet the rule has never been supposed to extend to those cases where the ships have traded or intended to trade, contrary to the revenue laws of *foreign* countries, because no country takes notice of the revenue laws of another; in such cases, therefore, the policy is good and valid; and, if a loss happens, the underwriter will be answerable. *Planche* v. *Fletcher*; Doug., 238.

The case of *Camden and others* v. *Anderson*, was that of an assurance made in direct contravention of the exclusive right of trading granted to the East India Company by various acts of parliament. The underwriters were deemed not to be liable. 6 Term Rep., 725.

Soon afterwards, a case occurred, in which the rights of the East India Company, as far as they were affected by the treaty between this country and America, came to be discussed in an action on a policy of assurance. By the 13th article of that treaty, confirmed by 37 Geo. III., c. 79, § 22, The United States of America are permitted to trade to and from the British territories in India. This was an assurance, "at and from Bordeaux to Madeira and the East Indies, and back to America." It was contended, 1st, That the trade which the treaty meant to tolerate was a *direct* one between America and the East Indies; and 2dly, that the persons for whose benefit this assurance was effected were not entitled to the benefit of the treaty, they being *natural born* subjects of Great Britain, but had been domiciliated in America, and received there as citizens of those states. The court were of opinion that the trade, allowed by the treaty, need not be direct, but might be carried on circuitously through any country in Europe, including Great Britain; and farther, that though a natural born subject cannot throw off his allegiance, yet he may be a citizen of America for the purposes of commerce, and entitled in the latter character to all the benefits of the treaty. The plaintiffs therefore recovered. *Wilson* v. *Marryat*; 8 Term Rep., 31. and 1 Bos. and Pull., 430.

Though a ship may have committed some act in a former voyage, for which she is liable to seizure, yet an assurance on her for a particular voyage is legal; as, if it were otherwise, the consequence might be extended *ad infinitum*.—*Bird and others* v. *Appleton*; 8 East's Term Rep., 562.

If a ship be assured at and from A. to B., and there be any illegality in her traffic during her stay at A., the assured cannot recover on a policy for a loss happening between A. and B.

Trading with an enemy without the king's license is illegal, as also, in time of war, to bring, even in a neutral ship, goods purchased by an agent in the enemy's country, after the erup-

tion of hostilities; even though they were not purchased of the enemy: and the benefit of an assurance, effected for the commission of these acts, is forfeited.—*Potts* v. *Bell and others*, in error; 8 Term Rep., 548.—Previous judgment for the defendants in the Common Pleas reversed.

We may conclude the present subject with this principle: that all assurances upon a voyage generally prohibited, such as to an enemy's garrison, or upon a voyage directly contrary to an express act of parliament, or to royal proclamation in time of war, are absolutely null and void.

XIII. *Prohibited Goods.*

By the 4 and 5 William and Mary, c. 15, § 14, 15, 16, it is enacted, "That all and every person or persons, who, by way of assurance or otherwise, *should undertake or agree to deliver any goods, wares, or merchandises*, whatsoever, to be imported from parts beyond the seas, at any port or place whatsoever, within this kingdom of England, dominion of Wales, or town of Berwick-upon-Tweed, *without paying the duties* and customs that should be due and payable for the same at such importation, *or any prohibited goods whatsoever*; or, in pursuance of such assurance, undertaking, or agreement, should deliver, or cause or procure to be delivered, any prohibited goods or merchandise whatsoever, without paying such duties and customs as aforesaid, knowing thereof, and all and every their aiders, abettors, and assistants, should for every such offence forfeit and lose the sum of *five hundred pounds*, over and above all other forfeitures and penalties to which they are liable by any act already in force." It is also enacted, sect. 15, "That all and every person or persons, who should agree to pay any sum or sums of money for the assuring or conveying any goods or merchandise that should be so imported, without paying the customs and duties due and payable at the importation thereof, or of any prohibited goods whatsoever, or should receive or take such prohibited goods into his or their house, or warehouse, or other place on land, or such other goods, before such customs or duties were paid, knowing thereof, should also for every such offence forfeit and lose the like sum of five hundred pounds: the one half of the said forfeiture to be to their majesties, and the other half to the informer, or to such persons as should sue for the same. And if the assurer, conveyor, or manager, of such fraud should be the discoverer of the same, he should not only keep the assurance-money or reward given him, and be discharged of the penalties, to which he was liable by reason of such offence, but should also have to his own use one half of the forfeitures hereby imposed upon the party or

parties making such assurance or agreement, or receiving the goods as aforesaid: and, in case no discovery should be made by the assurer, conveyor, or managers, aforesaid, and the party or parties assured or concerned in such agreement should make discovery thereof, he should recover and receive back such assurance money or premium as he had paid upon such assurance or agreement, and should have to his own use one moiety of the forfeitures imposed upon such assurer, conveyor, or manager, as aforesaid, and should also be discharged of the forfeitures hereby imposed upon such assurer, conveyor, or manager, as aforesaid, and should also be discharged of the forfeitures hereby imposed upon him or them."

By 8 and 9 W. III., c. 36. § 1, it is enacted, "That every person, who should import any foreign *alamodes* or *lustrings* from parts beyond the seas, into any port or place within the kingdom of England, dominion of Wales, &c. without paying the rates, customs, impositions, and duties, that should be due and payable for the same at such importation, or should import any alamodes or lustrings, prohibited by law to be imported, or should, by way of assurance or otherwise, undertake or agree to deliver, or, in pursuance of any undertaking, agreement, or assurance, should deliver, or cause to be delivered, any such goods or merchandise, and every person who should agree to pay any sum or sums of money, premium, or reward, for assuring or conveying any such goods or merchandise, or should knowingly take or receive the same into his, her, or their house, shop, warehouse, custody, or possession, such person or persons should and might be prosecuted for any of the offences or matters aforesaid, in any action, suit, or information: and thereupon a *capias*, in the first process, specifying the sum of the penalties sued for, should and might issue, and such person or persons should be obliged to give sufficient bail and security for natural born subjects: persons naturalized, or denizens, to the officer executing the writ, to appear in court to answer such suit, and at such appearance to give sufficient bail, to answer and pay all the forfeitures and penalties incurred for such offence to yield his, her, or their bodies to prison."

By 12 Geo. II., c. 21, § 29, it is enacted, "That every person, who, *by way of assurance*, or otherwise, should undertake or agree, that any *wool*, *wool-fells*, *wool-flocks*, *morthings*, *worsted*, &c., should be carried or conveyed to any parts beyond the seas from any port or place whatsoever within this kingdom or Ireland; or, in pursuance of such assurance, undertaking, or agreement, should deliver, or cause to be delivered, any of the said goods in parts beyond the seas, such person, and all and every his aiders, &c. should for every such offence forfeit and lose the sum of five hundred pounds." The next section inflicts alike

penalty on the assured, and the following one, in order to encourage the parties to disclose such contract, releases the party informing from all the penalties to which he himself was subject, and also gives him the whole of the forfeiture, after deducting the charges of prosecution.

By sect. 33, it is enacted, "That all policies of assurance, which should be made on goods and merchandises, loaden or to be loaden on any ship or vessel, bound from Great Britain or Ireland, to foreign parts beyond the seas, which should afterwards appear to be *wool* or *woollen yarn*, or any other species of *wool* or *woollen manufactory from Ireland;* and all policies of assurance which should be made on any ship or vessel bound from Great Britain or Ireland to foreign parts beyond the seas, which should have on board any wool, woollen yarn, or any other species of wool or woollen manufactory from Ireland; should be deemed and taken to be null and void, notwithstanding any words or agreement whatsoever, which should be inserted in any such policy of assurance; and nothing should be recovered by the assured in either case for loss or damage, or for the premium which should have been given as the consideration for the assuring such goods and merchandises, ship, or vessel."

The forty-fifth section of 28 Geo. III., c. 38, declares, that "every person or persons, who, by way of assurance or otherwise, shall undertake or agree that any *sheep*, *wool*, *or any other* of the enumerated articles in the statute, shall be carried or conveyed to any parts beyond the seas, from any port or place whatsoever within the kingdom, or, in pursuance of such undertaking or agreement, shall deliver, or cause or procure to be delivered, any sheep, wool, &c., in parts beyond the seas, such person or persons, their aiders and abettors, shall, upon conviction, be liable to the same punishment as the exporters."

The next section inflicts a like penalty upon the persons paying of such assurance.

By sect. 48, it is declared, that all policies of assurance which shall be made on goods and merchandises, laden or to be laden on any ship or vessel bound from Great Britain to foreign parts, which shall afterwards appear to be wool, woollen, or worsted yarn, &c., shall be deemed to be null and void, notwithstanding any words or agreement whatsoever which should be inserted in such policy of assurance, and nothing shall be recovered by the assured from the assurer for loss or damage, or for the premium which shall have been given as the consideration for such assurance.

To mention by name all the different kinds of merchandise, which fall under the description of prohibited goods, would be

tedious; and as it should seem, wholly unnecessary. Thus much may be laid down as a general proposition, that all assurances upon goods, forbidden to be exported or imported, by positive statutes, or by the king's proclamation *in time of war*; or which, from the nature of the commodity, and by the laws of nations, must necessarily be contraband, are absolutely null and void. Under the first division may be ranked, all offences against the revenue laws of this country; and, therefore, if an assurance were made in order to protect smuggled goods, such assurance would doubtless be of no effect. To this head, also, may be referred any breach of the navigation acts, which were established for the protection, encouragement, and advancement of our commercial and naval interests.

There are likewise some commodities which, from their nature, as well as by the law of nations are contraband; and, upon the subject, all writers agree in establishing this as a settled undisputed rule, that whoever conveys any necessaries to a besieged town, camp, or port, is guilty of a breach of the law of nations. This being the case, an assurance upon such commodities must necessarily be void and of no effect, agreeable to the principles which have been advanced.

But assurances upon goods, the exportation or importation of which are forbidden by the laws of *other* countries, are valid; because one nation never takes notice of the revenue laws of another.—Douglas's Rep. 238.

XIV. *Wager Policies.*

We now proceed to treat of those policies which, by the positive statute laws of the country, are declared to be absolutely null and void. Of these the largest class are wager policies, or policies, as they are called, upon *interest or no interest.*

While policies upon *interest or no interest* were legal, there was this difference between them and the assurances *upon interest;* namely, in the latter the loss actually sustained, whether total or partial, was recovered; and in the former there could be no recovery but for a total loss. The former of these kinds having given rise to wagering speculations of considerable and detrimental extent, an act of parliament passed in the 19th year of the reign of King George II., c. 37, entituled, "An act to regulate assurance on ships belonging to the subjects of Great Britain, and on merchandises or effects laden thereon." We shall here cite as much of it as relates to the present subject of wager policies, and afterwards the other clauses of it, under those heads to which they more immediately reply.

The preamble states: "Whereas it hath been found, by ex-

perience, that making assurances *interest or no interest*, or without farther proof of interest than the policy, hath been productive of many pernicious practices, whereby a great number of ships, with their cargoes, have either been fraudulently lost and destroyed, or taken by the enemy in time of war; and such assurances have encouraged the exportation of wool, and the carrying on many other prohibited and clandestine trades, which, by means of such assurances, have been concealed, and the parties concerned secured from loss, as well to the diminution of the public revenue as to the great detriment of fair traders; and, by introducing a mischievous kind of gaming or wagering, under pretence of assuring the risk on shipping and fair trade, the institution and laudable design of making assurances hath been perverted; and that which was intended for the encouragement of trade and navigation, has, in many instances, become hurtful of and destructive to the same."

Sect. 1. "For remedy whereof it is enacted, that no assurance or assurances shall be made by any person or persons, bodies corporate or politic, on any ship or ships belonging to his Majesty, or any of his subjects, on any goods, merchandises, or effects, laden or to be laden on board of any ship or ships, *interest or no interest, or without farther proof of interest than the policy, or by way of gaming or wagering, or without benefit of salvage to the assurer;* and that every such assurance shall be null and void to all intents and purposes."

Sect. 2. "Provided always that assurances on private ships of war, fitted out by any of his majesty's subjects solely to cruise against his Majesty's enemies, may be made by or for the owners thereof, interest or no interest, free of average, or without benefit of salvage to the assurer; any thing herein contained to the contrary thereof in anywise notwithstanding."

Sect. 3. "Provided also, that any merchandise or effects, from any port or places in Europe or America, in the possession of the crowns of Spain or Portugal, may be assured in such way and manner, as if this act had not been made."

By the first section of the act, it is clear, that, at this day, all assurances made contrary to it are absolutely void, and of no effect. It may now be material to consider, first, what cases have been held not to fall within this description: and, secondly, those in which the policies have consequently been holden to be void.

This act does not extend to assurance of *foreign property*, and on foreign ships. *Thelluson* v. *Fletcher*, Doug. 301. *Craufurd* v. *Hunter*, 2 Term Rep.

It was formerly thought, that a *valued* policy was a wager policy, like *interest or no interest;* but this idea is now exploded. Of the difference between open and valued policies much has

been already said; and the origin of the latter was derived from this source: it being sometimes troublesome to the trader to prove the value of his interest, or to ascertain the quantity of his loss, he gave the assurer a higher premium to agree to estimate his interest at a precise sum. To recover upon this kind of policy, the assured need only prove that he had an interest, without showing the value. If, indeed, it appeared, or could be made to appear, that the interest proved was merely a cover to a wager, in order to evade the statute, there is no doubt such a policy would be void. *Lewis* v. *Rucker*, 2 Burr. 1167.

In an assurance on the profits expected to arise on a cargo of molasses belonging to the plaintiff, who had a contract with government to supply the army with spruce beer, Lord Mansfield thought it an assurable interest, and not contrary to the act of parliament, although a clause in the policy declared, "that, in case of loss, it was agreed that the profits should be valued at 1000*l.*, without any other voucher than the policy." He added, "the meaning of this policy is not to evade the act of parliament, but to avoid the difficulty of going into an exact account of the quantum. I cannot distinguish it from a valued policy; and there is no pretence for saying it is a *wagering* one."—*Grant* v. *Parkinson*; Mich., 22 Geo. III.

So likewise, in a later case, where the interest was declared by the policy to be *on the commissions of the plaintiff as consignee of the cargo, valued at* 1500*l.*, Lord Kenyon expressed a very strong opinion, that this was a good assurable interest; but, the matter being compromised, it did not come to any decision. *Flint* v. *Mesurier*; sittings after Hilary Term, 1796, at Guildhall.

In another case it appeared, that an assurance had been made upon any of the packet boats that should sail from Lisbon to Falmouth, or such other port in England as his Majesty should direct, for one year, upon any kind of goods and merchandises whatsoever. And it was agreed, that the goods and merchandises *should be valued at the sum assured* on such packet boat, *without further proof of interest than the policy*, and to make no return of premium from want of interest, being on bullion or goods. The assured had an interest in bullion on board the Hanover packet, which was lost within the time mentioned in the policy. The court held that this was an action of a peculiar sort; and was an excption out of the statute of the 19 Geo. II., c. 37, coming within the proviso in the third section (just quoted.) It is a mixed policy; partly a wager policy, partly an open one: and it is a valued policy, and fairly so without fraud or misrepresentation. Therefore the loss having happened, the assured is entitled as for a total loss.

It has also been solemnly settled, that, upon a joint capture by the army and navy, the officers and crews of the ships, *before condemnation*, have an assurable interest, by virtue of the prize act, which usually passes at the commencement of a war. *Le Cras* v. *Hughes*; B. R. 22 Geo. III.

So, in a modern case, it has been holden, that the captors of ships seized by them as prize, have an assurable interest in them, in the voyage home, for the purpose of bringing them to adjudication in the admiralty. *Boehm* v. *Bell*; 8 Term Rep. 154.

So, also, the commissioners, appointed under 35 Geo. III., c. 80, for the taking care and disposing of Dutch ships and effects, detained in or brought into the ports of this kingdom, have an *assurable interest therein*. *Craufurd* v. *Hunter*, 1 Term Rep. 13.

In a case, where a house in Spain, who were indebted to the plaintiffs, had consigned goods to Messrs. Dubois, and indorsed the bill of lading to them, with a letter annexed, directing them to hold a part of the said goods *for the use of the plaintiffs*: it was held, that the plaintiffs, although *they* had not ordered the goods, had yet an *assurable interest*, being creditors of the house in Spain.—*Hill and another* v. *Secreton*; 1 Bos. and Pull., 315.

In this construction of the act it has been holden, that all assurances, made by persons having *no interest* in the event about which they assure or without reference to any property on board, are merely wagers, destructive of the true end for which this contract was introduced into the mercantile world: and therefore are to be considered as absolutely null and void.—*Kent* v. *Bird*; Cowp., 583.

Where a man assures 2000*l*., and it turns out in proof that he has an interest to the value of a cable only, such an interest, will never be allowed to operate so as to evade the statute. Indeed, wherever the court can see, upon the face of the policy, that it is merely a contract of gaming, where indemnity is not the object in view, they are bound to declare such policy void. *Lowry and another* v. *Bordieu*; Doug., 451.

The second section of the act in question, which allows of assurances being made on private ships of war, interest or no interest, seems sufficiently clear, and requires no explanation.

XV. *Re-assurance; and double assurance.*

Re-assurance may be said to be a contract, which the first assurer enters into, in order to relieve himself from those risks which he has incautiously undertaken, by throwing them upon other underwriters, who are called re-assurers.

The re-assurer who is wholly unconnected with the original

owner of the property assured; and as there is no obligation between them originally, so none is raised by the subsequent act of the first underwriter. The risk of the assurer forms the object of the re-assurance, which is a new independent contract, not at all concerning the assured; who consequently can assume no power or authority with respect to it.—Pothier, tit. Assurance, No. 96.

Although such a contract seems perfectly fair and reasonable in itself, and might be productive of very beneficial consequences to those concerned in this important branch of trade; yet, like many other useful institutions, it was so much abused, and turned to purposes so pernicious to a commercial nation, and so destructive of those very benefits it was originally intended to promote and encourage, that the legislature was at last obliged to interpose, and by a positive law to cut off all opportunity of practising those frauds in future, which were become thus glaring and enormous.

Accordingly, by the fourth section of the 19 Geo. II., c. 37, it is enacted, "that it should not be lawful to make *re-assurance*, unless the assurer should be insolvent, become a bankrupt,* or die; in either of which cases, such assurer, his executors, administrators, or assigns, might make re-assurance, to the amount before by him assured, provided it should be expressed in the policy to be re-assurance."

This act is worded in such express terms, excluding every species of re-assurance, except in three instances of death, bankruptcy, or insolvency, that a doubt, as it would seem, could hardly be founded upon it. But as it was held, that the first clause of the statute, prohibiting assurances *interest or no interest*, did not extend to foreign ships: so it was argued that re-assurances made here on *the ships of foreigners* did not fall within the act. This point came on to be considered in the Court of King's Bench, in the year 1787, in the form of a special case, stating, that a re-assurance was made by the defendant on a *French vessel*, first assured by a *French underwriter* at Marseilles, who was living, and who, at the time of subscribing the second policy, was solvent.

The court (Ashurst, Buller, and Grose, justices,) were unanimously of opinion, that this policy of re-assurance was void: and that every re-assurance in this country, either by British subjects or foreigners, or British or foreign ships, is void by

* By the 19 Geo. II., c. 32, § 2, it is enacted, that when any obligor in a respondentia or bottomry bond, or any underwriter of a policy of assurance, become bankrupt before the loss of a ship or goods mentioned in such bonds or policies, the obligee of any such bond, or the assured in such policy, may, in cases of subsequent loss, prove their claims under such commission of bankruptcy, and be entitled to dividends as other creditors.

the statute, *unless the first assurer be insolvent, become a bankrupt, or die.*—*Andrée* v. *Fletcher;* 2 Term Rep., 161.

A *double assurance* is where the *same* man is to receive *two* sums instead of one, or the same sum twice over, for the same loss, by reason of his having made two assurances upon the *same* goods or the *same* ship. The first distinction between these two contracts is, that a re-assurance is a contract made by the first underwriter, his executor, or assigns, to secure himself or his estate; a double assurance is entered into by the assured. A re-assurance, except in the cases provided for by the statute, is absolutely void; a double assurance is not void; but still the assured shall recover only *one* satisfaction for his loss. Where a man has made a double assurance, he may recover his loss against which of the underwriters he pleases, but he can recover no more than the amount of his loss. It being thus settled, that the assured shall recover but one satisfaction, and that, in case of double assurance, he may fix upon which of the underwriters he will for the payment of his loss, it is a principle of natural justice, that the several assurers should all of them contribute in their several proportions, to satisfy that loss, against which they have all assured.

In the year 1763, it was ruled by Lord Mansfield, Chief Justice, and agreed to by the course of practice, that, upon a double assurance, though the assured is not entitled to two satisfactions, yet, upon the first action, he may recover the whole sum assured, and may leave the defendant therein to recover a rateable satisfaction from the other assurers.—*Newby* v. *Reed.* Sittings in London in Easter vacat. 1763. 1 Black. Rep., 416.

Thus also it was determined in a subsequent case at Guildhall. *Rogers* v. *Davis.* Sittings in Michaelmas vacation, 17 Geo. III., before Lord Mansfield.

Although a man, by making a double assurance, should not be allowed to recover a double satisfaction for the same loss, yet various persons may assure various interests on the same thing, and each to the whole value, (as the master for wages, the owner for freight, one person for goods, another person for bottomry,) and such a contract does not fall within the idea of a double assurance.—1 Burr., 496.

XVI. *Changing the Ship.*

Changing the ship, or, as it is commonly called, changing the bottom, will operate as a bar to the assured's recovering upon a policy of assurance against the underwriter. Except in some special cases of assurances upon *ship or ships*, it is essentially requisite, to render a policy of assurance effectual, that the name of the ship, on which the risk was to be run, should be inserted. This being done, it follows that the assured shall neither substi-

tute another ship for that mentioned in the policy, before the voyage commences, nor during the course of the voyage, remove the property assured to another ship, without consent of the underwriter, or without being impelled by a case of *unavoidable necessity.*

And this doctrine, relative to the changing the bottom of the ship, was alluded to by Lord Mansfield, when delivering the opinion of the court in the case of Pelly against the Royal Exchange Assurance Company. "One objection," said his Lordship, "was formed by comparing this case to that of changing the ship's bottom, on board of which goods are assured; *which the assured have no right to do.*"

This is to be taken as a rule, subject to the exceptions of inevitable or urgent necessity: for it has been held, that the owners of goods assured, by the act of shifting the goods from one ship to another, do not preclude themselves from recovering an average loss, arising from the capture of the second ship, if they act from necessity, and for the benefit of all concerned. *Plantamour* v. *Staples;* 1 Term E. 611, note (a.)

XVII. *Deviation.*

Deviation means a *voluntary departure,* without necessity, or any reasonable cause, from the regular and usual course of the specific voyage assured. Whenever a deviation of this kind takes place, the voyage is determined; and the underwriters are discharged from any responsibility. It is necessary to insert, in every policy of assurance, the place of the ship's departure, and also her destination. Hence it is a condition, on the part of the assured, that the ship shall pursue the most direct course, of which the nature of things will admit, to arrive at the destined port. If this be not done, if there be no special agreement to allow the ship to go to certain places out of the usual track, or if there be no just cause assigned for such a deviation, the underwriter is no longer bound by his contract. Nor is it all material, whether the loss be or be not in actual consequence of the deviation; for, the assurers are in no case answerable for a subsequent loss, in whatever place it happens, or to whatever cause it may be attributed. Neither does it make any difference, whether the assured was or was not consenting to the deviation.

The plaintiff was a shipper of goods in a vessel bound from Dartmouth to Liverpool. The ship sailed from Dartmouth and put into Looe; a place *she must of necessity pass by* in the course of the assured voyage. But, as she had no liberty given her by the policy to go into Looe; and although no accident befel her in going to or coming out of Looe, (for she was lost

after she got out to sea again,) yet Mr. Justice Yates held that this was a deviation, and a verdict was accordingly found for the underwriters.—*Fox* v. *Black;* Exeter assizes, 1767, before Mr. Justice Yates.

In another case, an action was brought upon a policy upon goods and other merchandises, loaded on board the ship called the Charming Nancy, from Dunkirk to Leghorn. The ship came to Dover in her way to procure a Mediterranean pass, and was afterwards lost. Lord Mansfield was of opinion, that the calling at Dover was a deviation: and the plaintiff was nonsuited.—*Towson* v. *Guyon;* before Lord Mansfield.

It was held, by Lord Chief Justice Lee, that, if the master of a vessel put into a port not usual, or stay an unusual time, it is a deviation, and discharges the assurer.

It has also been held, that even where there is a permission given *to touch and stay* at a place, that confers no privilege on the assured to break bulk, or to unload any part of the cargo.—*Stitt* v. *Wardell*, Mich., 1797.

In a case upon a policy of assurance on a ship *at and from Fisherow to Gottenburg, and back to Leith and Cockenzie*, it appeared that, in the homeward voyage, she went *first* to Cockenzie, which lay nearer to Gottenburgh than Leith, and was stranded in the harbour of Cockenzie. The court were of opinion, that unless there be some usage proved, or some special facts, to vary the general rule, the party assured must go to the several places mentioned in the policy, *in the order in which they are named;* and that to depart from that course is a deviation.—*Beatson* v. *Haward*, 6 Term Rep., 531.

So in a very late case, where a ship was assured, "at and from Lisbon to a port in England, with liberty to call at any one port in Portugal for any purpose whatever." The ship sailed from Lisbon to Ferro, to complete her loading. Ferro being a port to the southward of Lisbon, and lying directly out of the course of the voyage to England, Lord Kenyon was of opinion that it was a deviation; as the liberty given must be restrained to mean some port lying in the fair course of the voyage.—*Hogg* v. *Horner;* Michaelmas Term, 1797.

These principles being once established, it follows, as a necessary consequence, that, however short the time of deviation may be, if only for a single night, or even for an hour, the underwriter is equally discharged as if there had been a deviation for weeks or months; for, the condition being once broken, no subsequent act can ever make it good.

The ship George was bound from Cork to Jamaica, with a convoy, in the course of a war. The captain, in concert with two other vessels, took advantage of the night, and being ships

of force, cruised, and thereby deviated out of the direct course of their voyage, in hopes of meeting with a prize. Lord Camden clearly held, and a special jury of merchants, agreeably to his directions, determined that, from the moment the George deserted or deviated from the *direct voyage* to Jamaica, the policy was discharged.—*Coke* v. *Townson;* C. P., before Lord Camden.

In a modern case, however, it seemed to be the general opinion of Lord Mansfield and a special jury, and was sworn to be the usage by several witnesses, that if a merchant ship carry letters of marque, she may *chase* an enemy, though she may not *cruise*, without being deemed guilty of a deviation.

On an assurance of the Mary, at and from London to Cork and the West Indies, the question was, whether a ship, having letters of marque, could *chase* an enemy's ship, without being said to have deviated. The facts were, that in the night the Mary had descried a Spanish sail; and, after chasing, lost sight of her in six hours, till the morning, when they engaged. The Mary did not make a prize of the Spanish sail, but she proceeded on her voyage, and was afterwards captured. It was agreed on all hands, that a ship, in such circumstances, might not cruise; and several witnesses spoke to the usage and practice of ships, which carried letters of marque, chasing an enemy. It was admitted, on the part of the assurers, that if the letter of marque lost sight of an enemy, then it was no longer chasing but cruising. Lord Mansfield left it upon the evidence, to the jury, who found for the plaintiffs; thereby deciding the question in the affirmative.—*Jolly* v. *Walker;* at Guildhall, Easter vacation, 1781.

In a later case, the judges were unanimously of opinion, that if the assured, without the knowledge of the underwriters, take out a letter of marque, (but without a certificate, which, by the prize act, is necessary to its validity,) for the purpose of inducing the seamen to enter, and without any intention of cruising, this does not so essentially vary the risk as to vacate the policy. *Moss v. Byron*; 6 Term Rep., 379.

A voluntary deviation from the voyage assured vitiates a policy upon *freight*, as well as upon ship and goods. Thus on an assurance on freight of the ship Bethiah, *at and from Bordeaux to Virginia*, it appearing that the goods were to be carried in the ship from Bordeaux to St. Domingo, and that she was only to call at Norfolk in Virginia for orders; Lord Kenyon was of opinion, that the underwriters had a right to expect that the goods, upon which the freight was payable, were consigned to Virginia, and not to another place, and that the calling at Norfolk for orders was a deviation.—*Murdock* v. *Pott;* sittings at Guildhall after Trinity, 1795.

If a ship have the liberty of visiting two or more places by the policy, if she visit more than one, she must proceed according to the order in which the said places are mentioned in her policy; but must not sail to one place, and then depart retrogressively towards another.—*Marsden* v. *Reid;* Term Rep., Easter, 43 Geo. III.

A vessel which is permitted by her policy to chase, capture, and man prizes, is not warranted in *shortening sail* and *lying to*, in order to let the prize keep up with her for the purpose of being protected or convoyed into port, although such port be within the limits of the voyage assured.—*Lawrence, &c.,* v. *Sydenbotham;* Term Rep., Hilary, 45 Geo. III.

But, whenever the deviation arises from *necessity* and a *just cause*, the underwriter still remains liable, although the course of the voyage is altered.—Rocus, n. 52.

The ship Mediterranean went out in the merchant service with a letter of marque, and bound from Bristol to Newfoundland, assured by the defendant. In her voyage she took a prize, and returned with it to Bristol, and received back a proportionable part of the premium. Then another policy was made, and the ship set out, with express orders from the owners, that, if another prize was taken, the captain should put some hands on board such prize, and send her to Bristol; but that the ship in question should proceed with the merchant's goods. Another prize was taken in the due course of the voyage, and the captain gave orders to some of the crew to carry her to Bristol, and designed to go on to Newfoundland: but the crew opposed him, and insisted he should go back, though he acquainted them with his orders; upon which he was forced to submit; and, on his return, his own ship was taken, but the prize got in safe. And now, in an action against the underwriters, it was insisted, that this was such a deviation as discharged them. But the court and jury held, that this was excused by the force upon the master, which he could not resist, and therefore fell within the excuse of necessity, which had always been allowed. So the plaintiff had a verdict for the sum assured.—*Elton* v. *Brogden;* 2 Stra. 1264.

The first ground of necessity, which justifies a deviation, is that of *going into port to repair.* If a ship be decayed, or receives material and imminent danger in her voyage, which cannot be repaired at sea, and goes to the *nearest place* to refit, it is no deviation, because it is for the general interest of all concerned, and consequently for that of the underwriters, that the ship should be put in a proper condition capable of performing the voyage.—*Metteux and others* v. *the London Assurance Company*, 1 Atk. 545; and *Gilbert* v. *Readshaw;* sittings in London, Hilary Vacation, 1781.

The next excuse for leaving the direct course is *stress of weather.* Upon this point the rule is this: that, whenever a ship, in order to escape a storm, goes out of the direct course, or when, in the due course of the voyage, she is driven out of it by stress of weather, this is no deviation. It has also been held, that, if a storm drive a ship out of the course of her voyage, and she do the best she can to get to her port of her destination, she is not obliged to return to the point from which she was driven.—*Harrington* v. *Holkeld*, sittings in London, Mich. Vac. 1778.

If a ship be driven out of her port of loading by stress of weather, into another, and then does the best she can to get to her port of destination, it shall not be deemed a deviation, though she do not return to the port whence she was driven.—*Delancy* v. *Stoddard*, 1 Term Rep. p. 22.

A deviation may also be justified, if done to avoid an enemy, or seek for convoy: because it is in truth no deviation to go out of the course of a voyage, in order to avoid danger, or to obtain protection against it.—*Bond* v. *Gonsales*, 2 Salk. 445.—*Gordon v. Morley.*—*Campbell* v. *Bourdieu*, 2 Stra. 1265.

In the case of Bond against Nutt, in which the material question was, whether a warranty had or had not been complied with; the point of deviation for the purpose of procuring convoy, also came under consideration of the court. Upon that occasion Lord Mansfield and the whole court held, that if a ship go to the *usual place of rendezvous*, for the sake of joining convoy there ready, though such place be out of the direct course of the voyage, it is no deviation.—Cowp. Rep. 601.

And, in a more modern case, the only question was, whether there was a deviation or not. Lord Mansfield there directed the jury to find for the plaintiffs, if they believed that the captain fairly and *bona fide* acted according to the best of his judgment; that he had no other view or motive but to come the safest way home, and to meet with convoy; for, that it was no deviation to go out of the way to avoid danger.—*Enderby and another* v. *Fletcher;* sittings in London, Trin. Vac. 1780.

If, by the usage of any particular trade, it is customary to stop at certain places lying out of the direct course from A. to B. it is not a deviation to stop there, because it is a part of the voyage; but, in order to justify the captain of a ship in quitting the strait and direct line from the port of loading to that of delivery, there must be a precise, clear, and established usage upon the subject, not depending merely upon one or two loose and vague instances.

When a ship was assured from Liverpool to Jamaica, and had put into the Isle of Man, it appeared that there were *some instances* of the Liverpool ships putting in there, but it was not

the settled, common, established, and direct usage of the voyage, and trade; it was therefore held a deviation, and the underwriters were discharged from any loss that happened subsequent to the deviation.—*Salisbury* v. *Townson.*

So also if a ship be assured upon a trading voyage, it is incumbent on the parties assured to carry on that trade with the usual and reasonable expedition, otherwise their conduct will amount to a deviation, and discharge the policy.—*Hartly* v. *Buggin*, K. B. Mich. 22 Geo. III.

But though an actual deviation from the voyage assured is thus fatal to the contract of assurance, yet a deviation merely *intended*, but never carried into effect, is considered as no deviation, and the assurer continues liable. Thus, in the case of an assurance from Carolina to Lisbon, and at and thence to Bristol, it appeared that the captain had taken in salt, which he was to deliver at Falmouth before he went to Bristol; but, the ship was taken in the direct route to both, and before she came to the point where she would have turned off to Falmouth. Lord Chief Justice Lee held, that the assurer was liable; for, it was but an *intention to deviate*, and that was held not sufficient to discharge the underwriters.—*Foster* v. *Wilmer.* 2 Stra. 1249.

In the case of *Carter* v. *the Royal Exchange Assurance Company*, where the assurance was from Honduras to London, and a consignment to Amsterdam, a loss happened before she came to the dividing point between the two voyages, for which the assurers were liable to pay.—2 Stra. 1249.

If, however, it can be made appear, by evidence, that it never was intended, or came within the contemplation of the parties to sail upon the voyage assured; if all the ship's papers and documents be made out for a different place from that described in the policy, the assurer is discharged from all degree of responsibility, even though the loss should happen before the dividing point of the two voyages. This distinction was very properly taken by the Court of King's Bench, in *Woodridge* v. *Boydell*, Dougl. 16.

In a still later case the same doctrine was advanced, namely, that if a ship be assured from a day certain, from A. to B. and, before the day, sail on a different voyage from that assured, the assured cannot recover; even though the ship afterwards fall into the course of the voyage assured, and be lost after the day on which the policy was to have attached.—*Way* v. *Modigliani*, 2 Term Rep., 30.

In a very modern case in the Common Pleas, in which there was occasion to reconsider the two preceding cases, it was unanimously determined, that where the *commencement* and the *end* of the intended voyage continue the same as those described in the policy, an *intention* to go to an intermediate port, though

that intention should be formed previous to the ship's sailing, will not vitiate the assurance, till *actual* deviation.—*Kewly* v. *Ryan*, 2 H. Blackst. Rep. 343.

Conformably with this decision, another more recent case, but more critical in its circumstances, has been adjudged in the Court of King's Bench. It was on a policy of assurance on goods on board the Arethusa, "at and from London to Jamaica." The ship was cleared out from Jamaica only, but she sailed from London with directions to the captain to touch, in his way, at Cape Nicola Mole, in the island of St. Domingo, in order to land some stores there, pursuant to a charter party entered into for that purpose, and afterwards to proceed to Jamaica. St. Domingo lies in the track to Jamaica, and of course the voyage to Cape Nicola Mole is, to a certain point, the same. From that point there are three tracks which a ship, bound to Jamaica, may take: one of them immediately to the southward of St. Domingo, another still farther to the southward, and a third to the northward of that Island. The ship was captured in the latter track, *after* she had passed the general dividing point of the three several tracts, but *before* she had reached the particular point at which the continuing course to Jamaica divides from that leading into Cape Nicola Mole. Each of these three tracks have their advantage in different circumstances; but the captain was obliged, by the command of his owners, to take that to the northward, and had not the power to choose which of these he would take; and, in fact, he did not exercise his judgment or discretion in selecting the course, but adopted it as the most direct and proper one for going to the Cape, whither he was first bound. The court were of opinion, that when the ship came to the dividing point of the three tracks, and took the northern course, there the deviation commenced; because the captain did so, not from his judging it to be the best course for Jamaica, but the direct one to Cape Nicola Mole, whither he was bound. The underwriters were of course discharged.—*Middlewood* v. *Blakes*, 7 Term Rep. 162.

From the proposition just established, namely, that a mere *intention to deviate* will not vacate the policy, it follows, as an immediate consequence, that whatever damage is sustained before *actual* deviation, will fall upon the underwriters.

Thus it was held by Lord Chief Justice Holt, who said, that if a policy of assurance be made to begin from the departure of the ship from England, until, &c. and after the departure a damage happens, &c. and then the ship *deviates*; though the policy is discharged from the time of the deviation, yet for the damages sustained before the deviation, the assurer shall make satisfaction to the assured. *Green* v. *Young*, 2 Ld. Raym. 840. Salk. 444, S. G.

By the convoy act, (43 Geo. III., c. 57, § 4,) in case any ship during the war, shall sail without convoy, or afterwards wilfully *desert* or *separate* therefrom, contrary to that act, every policy of assurance upon such ship, goods or freight, (which shall be the property of the master, or of any person interested therein, who shall have been instrumental in, or privy to, causing such ships so to sail without convoy, or to separate,) shall be null and void to all intents and purposes.

In cases of deviation, the premium is not to be returned; because the risk being commenced, the underwriter is intitled to retain it.

XVIII. *Non-compliance with Warranties.*

A warranty in a policy of assurance, is a condition or contingency, a certain thing shall be done, or happen; and, unless that is performed, there is no valid contract. It is perfectly immaterial for what view the warranty is introduced: but being once inserted, it becomes a binding condition on the assured; and unless he can show that he has *literally* fulfilled it, or that it was *literally* performed, the contract is the same as if it had never existed.—1 Term Rep., p. 345.

But, as a warranty must be *strictly* complied with in favour of the underwriter, and against the assured, equal justice demands, that, if a strict and literal compliance with the warranty will support the demand of the assured, the decision ought to be in his favour; especially when by such decision, *all* the words in the policy will have their full operation.

In an action on a policy of goods, dated the 9th of December, 1784, *lost or not lost*, *warranted well this 9th day of December*, 1784; it appeared, that the warranty was at the foot of the policy; that the policy was underwritten between the hours of one and three in the afternoon of the 9th of December, that the ship was well at six o'clock in the morning, but was lost at eight o'clock the same morning. Upon a motion to set aside a nonsuit, which had been entered, Lord Kenyon and the other Judges were clearly of opinion, that the warranty was sufficiently complied with, if the ship were well at any time that day: that the nature of a warranty goes to determine the question; for, as it is a matter of indifference whether the thing warranted be or be not material, and yet must be literally complied with, still, if it be complied with, that is enough: and there was good reason for inserting these words, because they protected the underwriter from losses before that day, to which he would otherwise have been liable, as the policy was on the goods from the lading; and thus, too, the words *lost or not lost* have also their operation.—*Blackhurst* v. *Cockell*, 3 Term Rep., 360.

If a ship be warranted to sail on or before the 1st of August,

and she be prevented by any accident from sailing till the second of August, as by the sudden want of any necessary repair, or by the appearance of an enemy at the mouth of the port, the captain would do right not to sail; but there would be an end of the policy.—Cowper, 607.

In order to make written instructions valid and binding as a warranty, they must appear on the face of the policy itself; even though a written paper be *wrapt up in the policy*, when it is brought to the underwriters to subscribe, and shown to them at that time: or even though it be *wafered to the policy*, at the time of subscribing; still it is not in either case a *warranty*, or to be considered as part of the policy itself, but only as a *representation*. Both these instances have occurred before Lord Mansfield, in *Pawson* v. *Bornevelt;* Dougl. 12; and in *Bize* v. *Fletcher;* Dougl. 12.

But, if a policy of assurance *refer* to certain printed proposals, the proposals will be considered as part of the policy.—*Wooley* v. *Wood*, 6 Term Rep., 710.

It being thus settled, that a warranty must appear on the face of the instrument, it has likewise been determined that a warranty, written in the margin of the policy, was to be considered equally binding, and subject to the same strict rule of construction, as if inserted in the body of the policy itself.—Doug. 10, and 271.

The warranties which most frequently occur, and upon which the greatest questions have arisen, may be reduced to three classes: *warranty as to the time of sailing*, *warranty as to convoy*, *and warranty as to neutrality*.

1st. *As to the time of sailing*.—It has been held, that, when a ship has been warranted to sail on a particular day, though the ship be delayed for the best and wisest reasons, or even though she be detained by force; the warranty has not been complied with, and the assurer is discharged from his contract.—*Hare* v. *Whitmore*, Cowp. 784.

If the warranty be to sail *after* a specific day, and the ship sail before, the policy is equally avoided as in the former case; because the terms of the warranty are as much departed from in one case as in the other.—*Vezian* v. *Grant*, before Mr. Justice Buller, Guildhall, East. Vac. 1799.

But, when a ship is warranted to sail on or before a particular day, if she sail from her port of loading, *with all her cargo and clearances on board*, to the usual place of rendezvous at another part of the same island, merely for the sake of joining convoy, it is a compliance with the warranty, though she be afterwards detained there by an embargo beyond the day. The ground is, that when the ship leaves her port of loading, when she has a full and complete cargo on board, and has no other

object in view, but the safest mode of sailing to her port of delivery, her voyage must be said to commence from her departure from that port. If, indeed, her cargo was not complete, it would not have been a commencement of the voyage.—*Bond* v. *Nutt*, 601.

In assurances *at and from London*, warranted to depart on or before a particular day, it has long been a question, what shall be a departure from the port of London? or rather, what is the port of London? and, it is singular, that this point has never yet been judicially determined.

On the one hand it is said, that the moment a ship is cleared out at the custom-house, and has all her cargo on board, if she quit her moorings in the river on or before the day warranted, that the warranty is complied with. On the other side it is contended, and with great appearance of reason, that a ship is not ready for sea till she has got her custom-house cocket on board, which is the final clearance, and which she cannot have till she arrive at Gravesend; that till this cocket is received, the ship dares not proceed to sea under a penalty, and till then she is not entitled to the drawbacks; and that Gravesend is always considered as the limits of the port of London; and, unless the ship sail thence on or before the day limited, there is no beginning of the voyage, and the policy is forfeited.

The second species of warranty, which most frequently occurs in assurances, is that of *sailing under the protection of convoy*. Upon this subject, it is material to consider what is deemed a *convoy*. It has been settled, by the Court of King's Bench, that it is not every *single man of war*, which chooses to take a merchant ship under its protection, that will constitute such a convoy as a warranty means; but it must be a *naval force under the command of a person appointed by the government of the country to which they belong.—Hibbert* v. *Pigou*; B. R. Easter, 23 Geo. III., 1783.

From that case of Hibbert and Pigou, we likewise collect this; that a convoy appointed by the admiral commanding in chief upon a station abroad, is a convoy appointed by government.

Having seen what shall be deemed a convoy, let us proceed to consider what shall be a *departure* with convoy, within the meaning of a warranty to *depart with convoy*. The rule on this point is short and clear, that such a warranty implies, the ship shall go with convoy from the usual place of rendezvous, at which the ships have been accustomed to assemble; at Spithead, or the Downs, for the port of London; and Bluefields, for all the ports in Jamaica. And, from the particular port to such usual place of convoy, the ship is protected by the policy.

Lethulier's case, 2 Salk. 443, and *Gordon* v. *Morley*, 2 Stra. 1265.

Although the words commonly used are, "to *depart* with convoy," or, "to sail with convoy," yet, they extend to sailing with convoy throughout the whole of the voyage, as much as if those words were inserted. If, therefore, the convoy is only to go part of the way, that is not a compliance with the warranty; and the assurer is discharged from his engagements.—*Lilly* v. *Ewer*; Dougl., 72.

But, although it has been thus settled, that a ship must depart with convoy for the whole of the voyage; yet an *unforeseen* separation is an accident to which the underwriter is liable.—*Jefferey* v. *Legendra*; 3 Lev., 320.

Even where the ship has, by tempestuous weather, been prevented from joining the convoy at all, at least of receiving the orders of the commander of the ships of war, if she do every thing in her power to effect it, it shall be deemed a sailing with convoy, within the terms of the warranty.—*Victoria* v. *Cleeve*; 2 Stra. 1250.

But, if there be an opportunity of convoy; if the convoy throw out repeated signals to join, and, by the negligence and delay of the captain of the assured ship, the opportunity be lost, the warranty to depart with convoy is not complied with, and the underwriter is discharged.—*Taylor* v. *Woodness*; sittings at Guildhall, Hilary Vac., 4 Geo. III.

Although a ship must not voluntarily depart from convoy during the voyage, yet this species of warranty must always be construed with reference to the usage of trade, and to the orders of government. For, if the course upon a particular voyage has been to have a relay of convoy, protecting the trade from one port to another; or if government appoint a convoy to escort the trade of a place to a given latitude and no farther; and there be no other convoy on that station; a vessel, taking the advantage of such a convoy, has complied with the warranty to sail with convoy for the voyage.—*Smith* v. *Readshaw*; London Sitt. after East., 1781.—*De Ganay* v. *Clagget*; London Sitt. after Mich., 1795.—*De Guino* v. *Bewicke*, C. P. Mich., 36 Geo. III.

It has been questioned, whether it was necessary to have *sailing instructions* from the commander of the convoy. Mr. Justice Buller, in the case of *Webb* v. *Thompson*, (1 Bos. and Pull., 5.) said, "In point of law, the general proposition is that sailing instructions are necessary. But, if the captain, from any misfortune, from stress of weather, or other circumstances, be absolutely prevented from obtaining his instructions, still it is a departure with convoy; but then he must take the earliest opportunity to obtain them."

The third species of warranty is that of *neutrality;* or, that the ship or goods assured are neutral property. If the ship and property are neutral at the time when the risk commences, this is a sufficient compliance with a warrant of neutral property: because it is impossible for the assured to be answerable for the consequences of a war breaking out during the voyage. *Eden and another* v. *Parkinson;* Dougl., 705. And this doctrine has been since confirmed, in the case of *Tyson* v. *Gurney;* 3 Term Rep., 477.

However, if property belonging to a neutral country be assured in one of two belligerent powers, and be condemned by the other belligerent power, on capture, it belonging to the country in which it is assured, such condemnation is valid; since this sentence is to be regarded as a proof that the warranty of its being neutral is not complied with.—*Oddy* v. *Bovill;* Term Rep. Trinity, 42 Geo. III.

If a warranty of property belonging to any neutral power be rendered void by any act of the master, &c., of a ship, after the commencement of the voyage; and the ship be in consequence condemned by a belligerent power, the assured cannot recover.—*Garrels and another* v. *Secretan*, 8 Term Rep. 230.

XIX. *Return of Premium.*

The next object of our inquiry is, in what cases, and under what circumstances, there shall be *a return of premium.*

The principle, upon which the whole of this doctrine depends, is simple and plain. The risk of peril is the consideration for which the premium is to be paid: if the risk be not run, the consideration for the premium fails; and equity implies a condition, that the assurer shall not receive the price for running a risk, if, in fact, he runs none.—3 Burr., 1240.

Accordingly, in an action brought by the plaintiff, for 5*l.* received by the defendant to the plaintiff's use, where it appeared in evidence, that one Barkdale had made a policy of assurance upon account for 5*l.* premium, in the plaintiff's name, and that he had paid the same premium to the defendant, and that Barkdale had no goods then on board, and so the policy was void: Lord Chief Justice Holt said, "the money is not only to be returned by the custom, but the policy is made originally void, the party, for whose use it was made, having no goods on board; so that, by this discovery, the money was received without any *reason*, *occasion* or *consideration*, and, consequently, it was received, originally to the plaintiff's use.—And so judgment was given for the plaintiff.—*Martin* v. *Sitwell*, 1 Shower, 156.

Premiums on illegal assurances are not reçoverable.

Clauses are frequently inserted in policies of assurance, containing conditions on the performance or non-performance of which the premium is returnable.

An action was brought against an underwriter for a return of premium. The material part of the policy was in these words: "At and from any port or ports in Granada to London, or any ship or ships that shall sail on or between the first of May and the first of August, 1778, at 18 guineas *per cent.* to return 8 *per cent. if she sails from any of the West India Islands, with convoy for the voyage, and arrives.*" At the bottom there was a written declaration that the policy was on sugars (the muscovado valued at 20*l. per* hogshead). The ship, the Hankey, sailed with convoy, within the time limited: she arrived in the Downs, where the convoy left her; convoy never coming farther, and indeed seldom beyond Portsmouth. After she had parted with the convoy, she struck on a bank called the Pan-Sand, near Margate, and eleven of fifty-one casks of sugar were washed overboard, and the rest damaged. The ship was afterwards got off the bank, and proceeded up the river, arrived safe in the port of London, and was reported at the custom-house. The sugars saved, being sold, produced 340*l.* instead of 800*l.*, which was a valuation in the policy. The plaintiffs insisted that they were entitled to have 8*l. per cent.* also returned on the *valued* price of the eleven hogsheads of sugar, which were lost, and on the difference between what the remaining forty hogsheads produced, and their *valued* price. At the trial before Lord Mansfield, the plaintiffs had a verdict to the full amount of their demand. The chief question, upon a motion for a new trial, was to what the word "*arrives*" was intended to apply.

Lord Mansfield said, the ancient form of a policy of assurance, which is still retained, is, in itself, very inaccurate; but length of time, and a variety of discussions and decisions, have reduced it to certainty. If the assured will not warrant a departure with convoy, he pays the full premium, and in that case the underwriter says, "If it turn out that the ship departs with convoy, I will return part of the premium. But a ship may sail with convoy, and be separated from it by a storm, or other accident, in a day or two, and lose its protection. On a warranty to sail with convoy, that would be a breach of the condition; but to guard against that risk, the assurer adds, in policies of the present sort, "the ship must not only sail with convoy, but she must *arrive*," to entitle me to the return.—The words, *and arrives*, do not mean that the ship shall arrive in the company of the convoy, but only that she herself shall arrive. If she does, that shows, either that she had convoy the whole way or did not want it. But in the stipulation for the return of the premium,

no regard is had by the parties to the condition of the goods on the arrival of the ship. If it had been meant that no return should be made, unless *all* the goods arrived *safe*, they would have said, "if the ship arrive *with all the goods*," or "*safely with all the goods.*" The total or partial loss of the goods was the subject of the indemnity, and must be paid for by the underwriter. But, as to return of the additional premium, whether the goods arrive safe or not, makes no part of the question.—The rule for a new trial was accordingly discharged.—*Simond and another* v. *Boydell;* Doug., 255.

By the law of England, it has been clearly settled, that whether the cause of the risk not being run is attributable to the *fault*, *will*, or *pleasure* of the assured, still the premium is to be returned.—Cowp., 668.

The French, in the famous ordinances of Lewis XIV., have inserted an article, declaring that if the voyage is entirely broken up, before the departure of the ship, *even by the act of the assured*, the assurance shall be void, and the underwriter shall return the premium, reserving one half *per cent.* for his trouble. Accordingly, in England, it has always been the custom, when the policy is cancelled, to return the premium, deducting one half *per cent.*—Molloy, 1, 2, c. 7, § 12.

Some of the statutes for preventing the exportation of wool, and other staple commodities of the kingdom, and which, in order more effectually to prevent such exportation, have declared policies of assurance on these articles to be null and void, have enacted, that the premium shall not be restored to the assured.

When a policy is void, being made *without interest*, contrary to the statute of the 19 Geo. II., *if the ship arrive safe*, the court will not allow the assured to recover the premium.

In the English law there are two general rules established, which govern almost all cases. The first is, that where the risk has not been run, whether that circumstance was owing to the fault, the pleasure, or will of the assured, or to any other cause, the premium shall be returned. Another rule is, that if the risk has *once* commenced there shall be *no* apportionment or return of premium afterwards. Hence, in cases of deviation, though the underwriter is discharged from his engagement; yet, the risk being once commenced, he is entitled to retain the premium.

When, however, from the nature of the agreement between the parties, or the nature of the voyage, the contract becomes divisible, a part of the premium shall be retained for the risk run, and part shall be returned as the risk has never commenced.

The first time in which this doctrine was considered at any

length, was in a case which came before the court of King's Bench, in the year 1761. It was an assurance upon a ship, at five guineas *per cent.*, lost or not lost, *at and from London to Halifax, in Nova Scotia, warranted to depart with convoy from Portsmouth*, for the voyage, that is to say, the Halifax or Louisburg convoy. Before the ship arrived at Portsmouth, the convoy was gone. Notice of this was immediately given by the assured to the underwriter; and, at the same time, he was also desired either to make the long assurance or to return part of the premium. The jury found that the usual settled premium, from London to Portsmouth, was one and a half *per cent.* They also found that it *is usual* for the underwriter, in such cases, to return part of the premium; but the *quantum* is uncertain; (and the *quantum* must in its nature be uncertain, because it depends upon uncertain circumstances). It was stated, that the plaintiff made an offer to the defendant of allowing him to retain one and a half *per cent.* for the risk he had run on such part of the voyage as was performed under the policy, viz., from London to Portsmouth.

Lord Mansfield.—"I had not at the trial, nor have now, the least doubt about this question myself. These contracts are to be taken with great latitude: the strict letter of the contract is not so much regarded as the object and intention of it. Equity implies a condition, 'that the assurer shall not receive the price of running a risk, if he runs none.' This is a contract without any consideration, as to the voyage from Portsmouth to Halifax; for he intended to assure that part of the voyage as well as the former part of it, and has not. Consequently, the assured received no consideration for this proportion of his premium; and then this case is within the general principle of actions for money had and received to the plaintiff's use. I do not go upon the usage: for the usage found is only that, in like cases, it is usual to return a part of the premium, without ascertaining what part. If the risk is not run, though it is by the neglect, or even the fault, of the party assuring, yet the assurer shall not retain the premium. It has been objected, that the voyage being *begun*, and part of the risk being already run, the premium cannot be apportioned. But I can see no force in this objection. This is not a contract so entire, that there can be no apportionment; for, there are two parts in this contract, and the premium may be divided into two distinct parts, relative, as it were, to two distinct voyages. The practice shows that it has been usual, in such like cases, to return a part of the premium, though the *quantum* be not ascertained. And, indeed, the *quantum* must vary as circumstances vary; so that it never can have been fixed with any precise exactness. But though the *quantum* has not been ascertained, yet the principle is agreeable

to the general sense of mankind."—*Stevenson* v. *Snow;* 3 Burr., 1237.

Some years afterwards, the principle established in the foregoing case was attempted to be applied to one which it did not at all resemble. This was in an assurance for twelve months at 9*l.* *per cent.;* and, because the ship was captured within two months after the contract was made, a return of premium was demanded. But the contract in this case was entire; the premium was a gross sum stipulated, and paid for twelve months; and the parties, when they made the contract, had no intention or thought of a subsequent division, or apportionment, and therefore there could be no return of premium.—*Tyrie* v. *Fletcher;* Cowp., 666.

In a subsequent case, the Court of King's Bench adopted the same rule of decision, where the ship was assured for twelve months, and risk ceased at the end of two. A distinction was attempted to be made, because in this case, the whole premium, 18*l.*, was acknowledged to be received from the assured *at the rate of fifteen shillings per month:* and this, it was insisted, evidently showed, the parties intended the risk to continue from month to month. This objection was, however, overruled; the court being of opinion, that the case last mentioned decided this: and that the fifteen shillings *per* month was only a mode of computing the gross sum.—*Loraine* v. *Tomlinson;* Dougl., 564.

The two last cases were assurances upon time; but it seems perfectly clear, that when the contract is entire, whether it be for a *specified time* or *for a voyage*, there shall be no apportionment or return, if the risk has *once commenced.* And, therefore, when the premium is entire in a policy on a voyage, where there is no contingency at any period, out or home, upon the happening or not happening of which the risk is to end, nor any usage established upon such voyages, although there be several distinct ports, at which the ship is to stop, yet the voyage is one, and no part of the premium shall be recoverable.—*Bermon* v. *Woodbridge;* Doug., 751.

The last case upon this subject was also an action for a return of the premium. The policy was " at and from Jamaica to London, warranted to depart with convoy for the voyage, and to sail on or before the first of August, upon goods on board a ship called the Jamaica, at a premium of twelve guineas *per cent.*" The ship sailed from Jamaica to London on the 31st of July, 1782, but without any convoy for the voyage. At the trial before Lord Mansfield, the jury found a verdict for the plaintiff, subject to the opinion of the court, upon a case, stating the facts already mentioned. In addition to which, they *expressly* find, " that it is the constant and invariable usage in an assurance, at

and from Jamaica to London, warranted to depart with convoy, or to sail on or before the 1st of August, when the ship does not depart with convoy, or sails after the 1st of August, to return the premium, deducting one half *per cent.*"

Lord Mansfield.—"An assurance being on goods warranted to depart with convoy, the ship sails without convoy; and an action is brought to recover the premium. The law is clear, that, if the risk be commenced, there shall be no return. Hence questions arise of distinct risks assured by one policy or instrument. My opinion has been to divide the risks. I am aware that there are great difficulties in the way of apportionment, and, therefore, the court has sometimes leaned against them. But where an express usage is found by the jury, the difficulty is cured. They offered to prove the same usage as to the West Indies in general but I stopt them, and confined the evidence to Jamaica." The court, therefore, decided for the plaintiff. *Long* v. *Allen*; Easter Term, 25 Geo. III.

From the tenor of all these cases, it should seem, as Lord Mansfield said, that so many difficulties occur in apportioning the premium, that courts are often obliged to decide against it, unless there be some usage upon the subject.

XX. *Bottomry and Respondentia.*

Bottomry is in the nature of a mortgage of a ship, when the owner of it borrows money to enable him to carry on the voyage, and pledges the keel, or *bottom* of the ship, as a security for the repayment: and it is understood that, if the ship be lost, the lender also loses his whole money; but, if it return in safety, then he shall receive back his principal, and also the premium or interest stipulated to be paid, however it may exceed the usual or legal rate of interest. When the ship and tackle are brought home, they are liable, as well as the person of the borrower, for the money lent. But when the loan is not made upon the vessel, but upon the goods and merchandises laden thereon, which, from their nature, must be sold or exchanged in the course of the voyage, then the borrower only is *personally* bound to answer the contract; who, therefore, in this case, is said to take up money at *respondentia.* In this consists the difference between *bottomry* and *respondentia;* that the one is a loan upon the ship, the other upon the goods: in the former, the ship and tackle are liable, as well as the person of the borrower; in the latter, for the most part, recourse must be had to the *person* of the borrower. Another observation is, that in a loan upon bottomry, the lender runs no risk, though the *goods* should be lost: and, upon respondentia, the lender must be paid his principal and interest, though the *ship* perish, provided the goods are safe. In all other respects the contract of

bottomry and that of respondentia are upon the same footing.

These terms are also applied to another species of contract, which does not exactly fall within the description of either; namely, to a contract for the payment of money, not upon the ship and goods only, but upon the mere hazard of the voyage itself; as if a man lend 1000*l.* to a merchant to be employed in a beneficial trade, with a condition to be repaid with extraordinary interest, in case a specific voyage named in the condition shall be safely performed. But, by 19 Geo. II., it is enacted, "That all sums of money lent on bottomry or at respondentia upon any ship or ships belonging to his Majesty's subjects, *bound to or from the East Indies*, should be lent only on the ship, or on the merchandise or effects, laden or to be laden on board such ship, and should be so expressed in the condition of the said bond; and the benefit of salvage should be allowed to the lender, his agents, or assigns, who alone should have a right to make assurance on the money so lent; and in case it should appear that the value of his share in the ship, or in the merchandise or effects laden on board of such ship, did not amount to the full sum or sums he had borrowed as aforesaid, such borrower should be responsible to the lender for so much of the money borrowed as he had not laid out on the ship or merchandises laden thereon, with lawful interest for the same, in the proportion the money laid out should bear to the whole money lent, notwithstanding the ship and merchandises should be totally lost."

The statute, therefore, has entirely put an end to that species of contract which was last mentioned, namely, a loan upon the mere voyage itself, as far, at least, as relates to India voyages. The statute of 7 Geo. I., c. 21, § 2, declares, "That all contracts made or entered into by any of his Majesty's subjects, or any person in trust for them, for or upon the loan of any moneys, by way of the bottomry, or any ship or ships in the service of foreigners, and bound or designed to trade in the *East Indies or parts aforesaid*, shall be null and void."

This act, however, does not mean to prevent the King's subjects from lending money on bottomry, on foreign ships trading from their own country to their settlements in the East Indies.

It lately became a question in the Court of Common Pleas, whether an American ship, since the declaration of American independence, was a *freight* ship within the statute of the 7 Geo. I., ch. 21, § 2. The court were much inclined to think the bond was void, the case being within the mischief designed to be remedied by the act. But the question was not decided. —*Sumner* v. *Green*, Mich., 30 Geo. III.

The contract of bottomry and respondentia seems to deduce its origin from the custom of permitting the master of a ship, when in a foreign country, to hypothecate the ship, in order to raise money to refit. Such a permission is absolutely necessary, and is impliedly given him in the very act of constituting him master, by the marine law, which in this respect is reasonable; for, if a ship happen to be at sea, and spring a leak, or the voyage is likely to be defeated from want of necessaries, it is better that the master should have it in his power to pledge the ship and goods, or either of them, than that the ship should be lost, or the voyage defeated. But he cannot do either for any debt of his own, but merely in a case of *necessity*, and for *completing the voyage*. Although the master of the vessel has this power while abroad, because it is absolutely necessary for the purposes of commerce and navigation, yet the very same authority, which gave that power in those cases, has denied it when he happens to be in the same place where the owners reside. All the cases which have been determined upon the subject, seem to require, that the ship should be *abroad*, as well as in a *state of necessity*, to justify the captain or master in taking money on bottomry.—Molloy, in express terms, declares, that a master has no power to take up money on bottomry in places where his owners dwell: otherwise, he and his estate must be liable thereto.—Molloy, 1, 2, c. 11. § 11. If, indeed, the owners do not agree in sending the ship to sea, the majority shall carry it, and then money may be taken up by the master on bottomry for their proportion who refuse, although they reside on the spot, and it shall bind them all.

It is the essence of a contract of bottomry, that the lender run the risk of the voyage, and that both principal and interest be at hazard; for, if the risk go only to the interest of premium, and not to the principal also, though a real and substantial risk be inserted, it is a contract against the statute of usury, and therefore void. This has been frequently so determined in our courts of law.

An action of debt was brought upon an obligation. The defendant pleaded the statute of usury, and showed that a ship went to fish in Newfoundland, (which voyage might be performed in eight months,) and that the plaintiff delivered 50*l.* to the defendant, to pay 60*l.* upon the return of the ship off Dartmouth: and, if the said ship, by occasion of leakage or tempest should not return from Newfoundland to Dartmouth, then the defendant should pay 50*l.* only; and, if the ship never returned, he should pay nothing. And it was held, by all the court, not to be usury within the statute. For, if the ship had stayed at Newfoundland two or three years, he should have paid at the return of the ship 60*l.* and if the ship never re-

turned, then nothing: so that the plaintiff run hazard of having less than the interest which the laws allow: and, possibly, neither principal nor interest.—*Sharply* v. *Harrell*, Cro. Jac., 208.

The case was, upon another occasion, mentioned in argument by one of the judges of the bench; the principle on which it was decided was recognized, and the case itself was allowed to be law.—*Roberts* v. *Tremayne;* Cro. Jac., 508.

So also in another case of debt upon an obligation, conditioned to pay so much money, if such a ship returned within six months from Ostend in Flanders, to London, which was more by the third part than the legal interest of money; and, if she did not return, then the obligation to be void.—*Joy* v. *Kent;* Hard. Rep., 418.

In another case of debt upon an obligation for 300*l.*, the condition was, that if a ship went to Surat, in the East Indies, and returned safe, or if the owner, or the goods laden on board the ship, returned safe, then the defendant was to pay the principal to the plaintiff, and 40*l.* for each 100*l.*; but, that if the ship should perish by unavoidable casualties at sea, fire, or enemies, to be proved by sufficient testimony, then the plaintiff should have nothing. The doubt was, whether this was an usurious contract; and it was said to be so, because the payment depended upon so many things, one of which, in all probability, would happen. But the whole court held it not to be within the statute.—1 Siderfin, 27.

As the hazard to be run is the very basis and foundation of this contract, it follows, that if the risk is not run, the lender cannot be entitled to the extraordinary premium; for that would be to open a door to means by which the statute of usury might be evaded. This was so decided by the Court of Chancery.

This case was upon a bottomry bond, where the plaintiff was bound, in consideration of 400*l.*, as well to perform the voyage within the six months, as at the sixth months' end to pay 400*l.*, and 40*l.*, premium, in case the vessel arrived safe, and was not lost in the voyage. It happened that the plaintiff never went the voyage, whereby the bond became forfeited, and he now preferred his bill to be relieved. Upon the former hearing, as the ship lay all the time in the port of London, and there was no hazard of losing the principal, the lord keeper thought fit to decree, that the defendant should lose the premium of 40*l.*, and be contented with his principal and *ordinary interest.* And now, upon a re-hearing, he confirmed his former decree.—*Deguilder* v. *Depeister;* 1 Vern., 263.

It remains to be shown, what these risks are to which the lender undertakes to expose himself. These are, for the most part, mentioned in the condition of the bond, and are nearly the

same, against which the underwriter, in a policy of assurance, undertakes to indemnify. These accidents are tempests, pirates, fire, capture, and every other misfortune, except such as arise either from the defects of the thing itself, on which the loan is made, or from the misconduct of the borrower.

Capture here does not mean a mere temporary taking, but it must be such a capture as to occasion a total loss. And, therefore, if a ship be taken, and detained for a short time, and yet arrive at the port of destination within the time limited, (if time be mentioned in the condition,) the bond is not forfeited, and the obligee may recover.—*Joyce* v. *Williamson;* B. R., Mich. Term, 23 Geo. III.

A lender on bottomry, or at respondentia, is neither entitled to the benefit of salvage, nor liable to contribute in case of a general average.—*Walpole* v. *Ewer;* Sittings after Trinity, 1789.

It has been said, that, if the accident happen by default of the borrower or of the captain, the lender is not liable, and has a right to demand the payment of the bond. If, therefore, the ship be lost by a wilful deviation from the track of a voyage, the event has not happened upon which the borrower was to be discharged from his obligation.—*Western* v. *Wildy;* Skin., 152.

It frequently happened that the borrowers on bottomry or at respondentia became bankrupts after the loan of the money, and before the event happened which entitled the lender to repayment; by which means the debt could not be proved under the commission, and the lenders were left to such redress as they could obtain from the bankrupt, who had previously given up every thing to his creditors. This being likely to prove a discouragement to trade, parliament was obliged to interpose; and it accordingly enacted, "That the obligee in any bottomry or respondentia bond, made and entered into upon a good and valuable consideration, *bona fide*, should be admitted to claim, and, *after the contingency should have happened, to prove his or her debt or demands, in respect to such bond, in like manner, as if the contingency had happened before the time of issuing the commission of bankruptcy against such obligor*, and should be entitled unto, and should have and receive a proportional part, share, and dividend, of such bankrupt's estate, in proportion to the other creditors of such bankrupt, in like manner as if such contingency had happened before such commission issued: and that all and every person or persons, against whom any commission of bankruptcy should be awarded, should be discharged of and from the debt or debts owing, by him, her, or them, on every such bond as aforesaid, and should have the benefit of the several statutes now in force against bankrupts, in like manner, to all intents and purposes, as if such contingency had hap-

pened, and the money due in respect thereof had become payable before the time of the issuing of such commission."

XXI. *Forms of Policies.*

Form of a Policy of Assurance upon a Ship and Furniture, pursuant to Act of 35 Geo. III., c. 63.

500*l.* } IN the name of God, Amen.
——S- } as well own name, as for and in the
delivered the } name and names of all and every other person to
day of } whom the same doth, may, or shall, appertain,
in part or in all, doth make assurance, and cause
and them, and every of them, to be assured, lost or not lost, at and from upon the body, tackle, apparel, ordinance, munition, artillery, boat, or other furniture, of and in the good ship or vessel called the whereof is master, under God, for this present voyage, or whosoever else shall go for master in the said ship, or by whatsoever other name or names the said ship, or the master thereof, is or shall be named or called: beginning the adventure upon the said ship, &c., from and immediately following and so shall continue and endure until the said ship, with her said tackle, apparel, &c., shall be arrived at and there hath moored at anchor twenty-four hours in good safety; and it shall be lawful for the said ship in this voyage to proceed and sail to and touch and stay at any ports or places whatsoever without prejudice to this assurance; the said ship, &c., for so much as concerns the assureds, is, and shall be valued at Touching the adventures and perils at which we the assurers are content to bear and to take upon us in this voyage, they are, of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and countermart, surprisals, takings at sea, arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality soever, barratry of the master and mariners, and all other perils, losses, or misfortunes, that have or shall come to hurt, detriment, or damage, of the said ship, &c., or any part thereof: and in case of any loss or misfortune, it shall be lawful to the assureds, their factors, servants, and assigns, to sue, labour, and travel, for, in, and about, the defence, safeguard, and recovery, of the said ship, &c., or any part thereof, without prejudice to the assurance, to the charges whereof we the assurers will contribute each one according to the rate and quantity of his sum herein assured: and it is further agreed by us, the assurers, that this writing or policy of assurance shall be of

as much force and effect as the surest writing or policy of assurance heretofore made in Lombard Street, or in the Royal Exchange, or elsewhere in London: and so we the assurers are contented, and do hereby promise and bind ourselves, each one for his own part, our heirs, executors, and goods, to the assureds, their executors, administrators, and assigns, for the true performance of the premises, confessing ourselves paid the consideration due unto us for this assurance by the assured of at and after the rate of

In witness whereof we the assurers have subscribed our names and sums assured in London.

N. B. The ship and freight warranted free from average under three pounds *per cent.*, unless general, or the ship be stranded.

Policy of Assurance upon Goods, pursuant to Act of 35 *Geo. III.*, c. 63.

1000*l.* ——G. delivered the day of } IN the name of God, Amen. as well in 'own name, as for and in the name and names of all and every other person or persons to whom the same doth, may, or shall, appertain, in part or in all, doth make assurance, and cause and them, and every of them, to be assured, lost or not lost, at and from upon any kind of goods and merchandise whatsoever, loaden, or to be loaden, on board the good ship or vessel called the whereof is master, under God and for this present voyage, or whosoever else shall go for master in the said ship, or by whatsoever other name or names the same ship, or the master thereof, is or shall be named or called: beginning the adventure upon the said goods and merchandise from and immediately following the loading thereof on board of the said ship and so shall continue and endure until the said ship, with the said goods and merchandise whatsoever, shall be arrived at and the same there safely landed: and it shall be lawful for the said ship, in this voyage, to stop at any ports or places whatsoever without prejudice to this assurance: the said goods and merchandises, by agreement, are and shall be valued at Touching the adventures and perils which we the assurers are contented to bear, and do take upon us in this voyage, they are, of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and countermart, surprisals, takings at sea, ar-

rests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality, soever; barratry of the master and mariners, and of all other perils, losses, and misfortunes, that have or shall come to the hurt, detriment, or damage, of the said goods and merchandises, or any part thereof; and in case of any loss or misfortune, it shall be lawful to the assureds, their factors, servants, and assigns, to sue, labour, and travel, for, in, and about, the defence, safeguard, and recovery, of the said goods and merchandises, or any part thereof, without prejudice to this assurance, to the charges whereof we the assurers will contribute each one according to the rate and quantity of his sum herein assured; and it is agreed by us the assurers that this writing or policy of assurance shall be of as much force and effect as the surest writing or policy of assurance heretofore made in Lombard-street, or in the Royal Exchange, or elsewhere in London: and so we the assurers are contented and do hereby promise and bind ourselves, each one for his own part, our heirs, executors, and goods, to the assureds, their executors, administrators, and assigns, for the true performance of the premises, confessing ourselves paid the consideration due unto us for this assurance by the assured at and after the rate of

In witness whereof we the assurers have subscribed our names and sums assured in London.

N. B. Corn, fish, salt, flour, and seeds, are warranted free from average, unless general, or the ship be stranded; sugar, tobacco, hemp, flax, hides, and skins, are warranted free from average under five pounds *per cent.*, and all other goods free from average under three pounds *per cent.*, unless general, or the ship be stranded.

Policy of Assurance upon Ship and Goods, pursuant to Act of 35 Geo. III., c. 63.

10,000*l.* ——S. G. delivered the day of } IN the name of God, Amen. as well in own name as for and in the name and names of all and every other person or persons to whom the same doth, may, or shall, appertain, in part or in all, doth make assurance, and cause and them, and every of them, to be assured, lost or not lost, at and from upon any kind of goods and merchandises, and also upon the body, tackle, apparel, ordinance, munition, artillery, boat, and other furniture, of and in the good ship or vessel called the whereof is master, under God, for this present voyage

or whomsoever else shall go for master, in the said ship, or by whatsoever other name or names the same ship, or the master thereof, is or shall be named or called: beginning the adventure upon the said goods and merchandises from the loading thereof on board the said ship upon the said ship, &c., and so shall continue and endure during her abode there, upon the said ship, &c., and farther, until the said ship, with all her ordinance, tackle, apparel, &c., and goods and merchandises, whatsoever shall be arrived at upon the said ship, &c., until she hath moored at anchor twenty-four hours in good safety, and upon the goods and merchandise until the same shall be there discharged and safely landed; and it shall be lawful for the said ship, &c., in this voyage, to proceed and sail to and touch and stay at any port or place whatsoever, without prejudice to this assurance; the said ship, &c., goods and merchandises, &c., for so much as concerns the assured, by agreement between the assureds and assurers, in this policy, are and shall be valued at Touching the adventures and perils which we the assurers are content to bear and do take upon us in this voyage, they are, of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and countermart, surprisals, takings at sea, arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality soever, barratry of the master or mariners, and of all other perils, losses, and misfortunes, that have or shall come to the hurt, detriment, or damage, of the said goods and merchandises, and ship, &c., or any part thereof; and in case of any loss or misfortune, it shall be lawful to the assureds, their factors, servants, and assigns, to sue, labour, and travel, for, in, and about, the defence, safeguard, and recovery, of the said goods and merchandises, and ship, &c., or any part thereof, without prejudice to this assurance, to the charges whereof we the assurers will contribute each one according to the rate and quantity of his sum herein assured; and it is agreed by us the assurers that this writing or policy of assurance shall be of as much force and effect as the surest writing or policy of assurance heretofore made in Lombard-street, or in the Royal Exchange, or elsewhere in London; and so we the assurers are contented, and hereby promise and bind ourselves, each one for his own part, our heirs, executors, and goods, to the assured, their executors, administrators, and assigns, for the true performance of the premises, confessing ourselves paid the consideration due unto us for this assurance by the assured at and after the rate of

In witness whereof we the assurers have subscribed our names and sums assured in London.

N. B. Corn, fish, salt, fruit, flour and seeds, are warranted free from average, unless general, or the ship be stranded; sugar, tobacco, hemp, flax, hides, and skins, are warranted free from average under five pounds *per cent.*, and all other goods, also the ship and freight, are warranted free from average under three pounds *per cent.*, unless general, or the ship be stranded.

Ships and Goods.

London Assurance House.

No. , in London.

No.

By the Governor and Company of the London Assurance.

In the name of God, Amen.
as well in own name as for and in the name and names of all and every other person or persons to whom the same doth, may, or shall, appertain, in part or in all, doth make assurance, and causeth and them, and every of them to be assured, lost or not lost, at and from upon any kind of goods and merchandises whatsoever; and also upon the body, tackle, apparel, ordinance, munition, artillery, boat, and other furniture, of and in the good ship or vessel called the whereof is master, (under God,) for this present voyage or whosoever else shall go for master in the said ship or vessel, or by whatsoever other name or names the said ship or vessel, or the master thereof, is or shall be named or called: beginning the adventure upon the said goods and merchandises from and immediately following the loading thereof on board the said ship or vessel at and upon the said ship or vessel, &c., and so shall continue and endure during her abode there, upon the said ship or vessel, &c., and farther, until the said ship or vessel, with all her ordinance, tackle, apparel, &c., and goods and merchandises whatsoever, shall be arrived at and upon the said ship or vessel, &c., until she hath moored at anchor twenty-four hours in good safety, and upon the goods and merchandises, until the same be there safely discharged and landed: and it shall be lawful for the said ship or vessel, &c., in this voyage to proceed and sail to, and touch and stay at, any ports or places whatsoever without prejudice to this assurance, the said ship or vessel, &c., goods and merchandises, &c., for so much as concerns the assureds, by agreement between the assureds and the London Assurance,)

are and shall be rated and valued at without farther or other account to be given by the assureds for the same. Touching the adventures and perils, which the said London Assurance are contented to bear and do take upon them in this voyage, they are, of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and countermart, surprisals, takings at sea, arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality soever, barratry of the master and mariners, and of all other perils, losses, or misfortunes, that have or shall come to the hurt, detriment, or damage, of the said goods or merchandises, and ship or vessel, &c., or any part thereof: and, in case of any loss or misfortune, it shall be lawful to the assureds, their factors, servants, and assigns, to sue, labour, and travel, for, in, and about, the defence, safeguard, and recovery, of the said goods, merchandises, and the ship or vessel, &c., or any part thereof, without prejudice to this assurance, to the charges whereof the said London Assurance will contribute according to the rate and quantity of the sum here assured: and it is agreed, that this writing or policy of assurance shall be of as much force and effect as the surest writing or policy of assurance heretofore made in Lombard-street, or in the Royal Exchange, or elsewhere in London; and so the said London Assurance are contented, and do hereby promise and bind themselves and their successors to the assured, their executors, administrators, and assigns, for the true performance of the premises, confessing themselves paid the consideration due unto them from this assurance by the assured, at and after the rate of *per cent.* In witness whereof the said London Assurance have caused their common seal to be hereunto affixed, and the sum or sums by them assured to be hereunder written, at their office in London, this day of in the year of the reign of our sovereign lord by the grace of God, of the United Kingdom of Great Britain and Ireland, king, defender of the faith, &c., and in the year of our Lord

Free from all average on corn, flour, fruit, fish, salt, and seed; except general.

Free from average on sugar, rum hides, skins, hemp, flax, and tobacco, under five pounds *per cent.*, and on all other goods, and ship, under three pounds *per cent.*, except general.

The said governor and company are content with this assurance for

S. G. } S. G. No.
No. } L.

By the Corporation of the Royal Exchange Assurance.

In the name of God, Amen.
as well in own name as for and in the name and names of all and every other person or persons to whom the same doth, may, or shall, appertain, in part or in all, doth make assurance, and causeth and them and every of them to be assured, lost or not lost, upon any kind of goods and merchandises whatsoever loaden or to be loaden, and also upon the body, tackle, apparel, ordinance, munition, artillery, boat, and other furniture, of and in the good ship or vessel called the burthen or there abouts whereof is master (under God,) for this present voyage or whosoever else shall go for master in the said ship, or by whatsoever other name or names the same ship or the master thereof is or shall be named or called: beginning the adventure upon the said goods and merchandises from and immediately following the loading thereof on board the said ship and upon the said ship, &c., and so shall continue and endure during her abode there upon the said ship, &c., and farther, until the said ship, with all her ordinance, tackle, apparel, &c., and goods and merchandises whatsoever, shall be arrived at upon the said ship, &c., until she hath there moored at anchor twenty-four hours in good safety, and upon the goods and merchandises, until the same be there discharged and safely landed: and it shall be lawful for the said ship, &c., in this voyage to proceed and sail to, and touch, and stay at, any ports or places whatsoever, without prejudice to this assurance, the said ship, &c., goods and merchandises, &c., for so much as concerns the assureds, (by agreement made between the assureds and the corporation in this policy,) are and shall be rated and valued at sterling, without farther account to be given by the assureds for the same. Touching the adventure and perils which the said corporation are contented to bear and to take upon them in this voyage, they are, of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and countermart, surprisals, takings at sea, arrests, restraints, and detainments, of all kings, princes, and people, of what nation, condition, or quality, soever, barratry of the master and mariners, and of all other perils, losses, and misfortunes, that have or shall come to the hurt, detriment, or damage, of the said goods and merchandises, and ship, &c., or any part thereof, and in case of any loss or misfortune, it shall be lawful to the assureds, their factors, servants, and assigns, to sue, labour, and travel, for, in, and

about, the defence, safeguard, and recovery, of the said goods and merchandises, and ship, &c., (or any part thereof,) without prejudice to this assurance, to the charges whereof the said corporation will contribute according to the rate and quantity of the sum herein assured: and it is agreed by the said corporation, that this writing or policy of assurance shall be of as much force and effect as the surest writing or policy of assurance heretofore made in Lombard-street, or in the Royal Exchange, or elsewhere in London: and so the said corporation are contented, and do hereby promise and bind themselves and their successors to the assureds, their successors, administrators, and assigns, for the true performance of the premises, confessing themselves paid the consideration due unto them for this assurance by at and after the rate of *per cent.* In witness whereof the said corporation have caused their common seal to be hereunto affixed, and the sum or sums by them assured, to be hereunder written, at their office in the Royal Exchange of London, this day of in the year of the reign of our sovereign lord by the grace of God, of the United Kingdom of Great Britain and Ireland, king, defender of the faith, &c., and in the year of our Lord

The said corporation are content with this assurance for

Free from all average on corn, flour, fish, salt, fruit, seed, hides, and tobacco, unless general, or otherwise specially agreed.

Free from average of sugar, rum, skins, hemp, and flax, under five *per cent.*, and on all other goods, and on ship, under three *per cent.*, except general.

By order of the Court of Directors.

Form of a Respondentia Bond.

Know, all men, by these presents, that held and firmly bound to in the sum or penalty of of good and lawful money of Great Britain, to be paid to the said or to certain attorney, executors, administrators, or assigns; to which payment well and truly to be heirs, executors, and administrators, firmly, by these presents, sealed with seal, Dated this day of in the year of the reign of our sovereign lord by the grace of God, of the United Kingdom of Great Britain and Ireland, king, defender of the faith, and in the year of our Lord one thousand eight hundred and

The condition of the above-written obligation is such,

that whereas the above-named hath, on the day of the date above-written, lent unto the above-bound the sum of upon the merchandises and effects to that value laden or to be laden on board the good ship or vessel called the of the burthen of tons, or thereabout, now in the River Thames, whereof is commander: If the said vessel do or shall, with all convenient speed, proceed and sail from and out of the said river of Thames, on a voyage to any ports or places in the East Indies, China, Persia, or elsewhere beyond the Cape of Good Hope, and thence do and shall sail and return into the said river of Thames, at or before the end and expiration of thirty-six calendar months, to be accounted from the day of the date above-written, and that without deviation (the dangers and casualties of the seas excepted). And if the above-bound heirs, executors, or administrators, do and shall, within days next, after the said ship or vessel shall be arrived in the said river of Thames, from the said voyage, or at the end and expiration of the said thirty-six calendar months, to be accounted as aforesaid, (which of the said time shall first and next happen,) well and truly pay, or cause to be paid, unto the above-named executors, administrators, and assigns, the sum of of lawful money of Great Britain, together with of like money, by the calendar month, and so proportionally for a greater or lesser time than a calendar month, for all such time, and so many calendar months as shall be elapsed and run out of the said thirty-six calendar months, over and above twenty calendar months, to be accounted for from the day of the date above-written; or if, in the said voyage, and within the said thirty-six calendar months, to be accounted as aforesaid, an utter loss of the said ship or vessel by fire, enemies, men of war, or any other casualties should unavoidably happen; and the above-bound heirs, executors, and administrators do and shall, within six months next after the loss, pay and satisfy to the said executors, administrators, or assigns, a just and proportional average on all goods and effects which the said carried from England on board the said ship or vessel, and on all other the goods and effects of the said which shall acquire during the said voyage, and which shall not be unavoidably lost: then the above-written obligation is to be void, and of no effect, or else to stand in full force and virtue.

Sealed and delivered (being first duly stampt) in the presence of }

J. S.

XXII. *Cases recently adjudged, and illustrating different points of the preceding sections.*

1. Proof of ownership.—It has been observed by Mr. Abbott, in his valuable book on Merchant Shipping, that whenever the title to a ship comes strictly and properly into question, no claim can be received in opposition to the modes of conveyance required by the statutes. But there are many cases in which the possession of property, and acts of ownership exercised upon it, furnish presumptive evidence of a title to it; and some, also, in which the possession alone is sufficient to maintain an action: and it has been held that a British ship does not, as to these points, differ from any other sort of property.

Thus in an action (*Robertson and another* v. *French*, 4 *East*, 130,) on a policy of assurance effected upon the ship *Chesterfield*, while absent on a foreign voyage, wherein the interest of the ship was alleged to be in *Robertson* and *Walker*, and in which it became a question whether that allegation was sustained upon the evidence given in the cause, *Lord Ellenborough*, C. J. said, "As to the first point made in this case, on the part of the defendant, viz. that the ownership alleged was not sufficiently proved: it was proved by the captain (*Brooks*) in the ordinary way, that the owners by whom, as such, he was appointed and employed, were the persons in whom the ownership is by the declaration averred to be. And though it afterwards appeared by his answers, on cross-examination, that the ownership was derived to those persons under a bill of sale, executed by himself, as attorney to one *Lawrence Williams* the former owner, it did not on that account become necessary for the plaintiffs to produce that bill of sale, or the ship's register, or to give any further proof of such their property; the mere fact of their possession as owners being sufficient *primâ facie* evidence of ownership, without the aid of any documentary proof of title-deeds on the subject, until such further evidence should be rendered necessary in support of the *primâ facie* case of ownership, which they made, in consequence of the adduction of some contrary proof on the other side. No such contrary proof was, however, in this case, given on the part of the defendant. For the prior register in the name of *Lawrence Williams*, as owner in 1799, and a subsequent register to the same person upon a sale at the *Cape*, in 1802, under a decree of the court of vice-admiralty, and which were given in evidence by the defendant, were perfectly consistent with a title in other persons *in the mean time*, agreeable to the averment in the declaration.

Again, in an action of trover brought for divers quantities of timber, wood, and materials, it appeared at the trial that the ship *Spring*, with the cargo, belonging to a merchant in *London*, was stranded on the coast of *Norfolk;* he went thither and saved the cargo; and afterwards sold the vessel as she lay, being then a complete hull, to the plaintiff for 600*l.*, which the plaintiff paid him. He sold her as a ship, but the transfer was not made in the way required by the statutes. The plaintiff employed several men for some days in endeavouring to get the ship off, and superintended their exertions, and considerable hopes of success were entertained for a time; but in the end the ship went to pieces. The plaintiff, by his agents, then endeavoured to preserve the wreck; some pieces floated away and drifted on the farm of the defendant, who collected them together, broke up part in an unskilful and injurious manner, and refused to deliver them up to the plaintiff's agent, who demanded them of him. The cause was tried before the Chief Justice of the Court of Common Pleas, and the plaintiff was nonsuited on the ground of want of title, from the imperfection in the mode of transferring the property from the merchant to him. The cause was afterwards brought before the same court for reconsideration, and after argument, the Chief Justice and the two other Judges present, agreed in opinion that the plaintiff ought to have recovered. The ground of the decision was, that the plaintiff was in the actual possession, and the defendant a mere wrong-doer, without any colour of title; and that, although the plaintiff had failed to establish a complete title from the want of compliance with these statutes, yet he claimed under one who had a perfect title, and who was not now contesting the matter, and he had the possession against those who wrongfully interfered without colour of right: and his situation was compared to that of an agister, carrier, factor, and other bailées, whose title the law does not allow a mere wrong-doer to dispute. A new trial was accordingly directed, and the plaintiff ultimately succeeded in the cause.—*Sutton* v. *Buck*, 2 *Taunton*, 302.

It was the practice for a considerable time to produce the register from the custom-house at trials at *Nisi Prius* as proof of title, and the proof was received without question or objection. In one case indeed, Lord Ellenborough, who now presides in the Court of King's Bench, received the register as *primâ facie* evidence of ownership, in an action brought for stores supplied to a ship; declaring, however, that he would admit contrary evidence on the part of any of the defendants, to show that they had not assented to their names being placed on the register; *Stokes* v. *Carne*, 2 Camp. Rep. at N. P. 339. But this matter having in other causes been brought before the Courts

at Westminster, it has been held that the register alone does not furnish even *primâ facie* evidence *to charge* a person as owner of a ship, in a suit between private individuals; *Frazer* v. *Hopkins and another*, 2 Taunton, 5. Such an use of the register was certainly not in the contemplation of the legislature: and, it is obviously possible, although not very likely to happen, that the name of a person may be placed on the register without his assent. A bill of sale duly and formally executed by an apparent vendor, but not accepted by the intended purchaser, will not transfer the property to him, and consequently is not evidence *to charge* him, unless it appears to have been accepted by him; *Tinkler* v. *Walpole*, 14 East, 226. Neither is the affidavit made by a third person, in order to obtain a register, to be received in evidence *against* the parties named in it, without some proof of their adoption and assent; *Tinkler* v. *Walpole*, 14 East, 226. *A fortiori*, a part owner, who, to an action brought against himself, has pleaded in abatement, that there are other part owners, who ought to be joined with him in the suit, cannot sustain his plea by the bare production of a register containing their names; *Flower* v. *Young*, sittings at Guildhall, before Lord Ellenborough, after Easter Term, 1812.

An action was brought against three persons of the names of Humble, S. Holland, and Williams, to recover the price of a quantity of rope furnished by the plaintiffs at Liverpool, in the month of January, 1810, for the use of the ship Susanna. Holland and Williams had become bankrupts: and the question was, whether Humble was liable. The order was given in the name of the owners of the Susanna, by the clerk of a mercantile house at Liverpool, trading under the firm of S. Holland & Co. In order to charge the defendant Humble as a part owner, the defendants produced the following documentary evidence. 1. A certificate of registry at Liverpool, dated the 8th of June, 1808, naming S. Holland, the defendant Humble, and one Strickland, as part owners, which appeared to have been granted upon the affidavit of Holland and Strickland. 2. An indorsement on the certificate, dated the 14th of June, 1808, importing that Strickland had sold his interest to Holland and Humble. 3. Another indorsement, dated the 21st of November, 1809, recording a transfer of a moiety as made by Humble and Holland to the defendant Williams, on the 7th of October in that year, while the ship was at sea, and which was signed by Holland, as attorney for Humble. This was probably intended to convey the whole of Humble's interest, and was drawn out in this form by mistake. Another indorsement on the certificate, dated the 7th of March, 1811, importing a transfer of the whole by the assignees of Holland and Williams, then bankrupts, and by Humble to other persons: this was signed by Humble. It

will be observed of these documents, that the three first might have been made without the knowledge or privity of Humble; and therefore, according to the foregoing cases, were not evidence to charge him: and that the last was made long after the sale of the goods, and therefore could not have given any information to the sellers at the time of sale, if they had then resorted to the custom-house in order to learn the names of the owners of the ship. On the part of the defendant it was shown, that he had at a former period been in partnership with Holland at Liverpool, under the firm of Humble and Holland, and they had sold the ship to a person of the name of Kinnard, who sent her to sea; but this sale was not noticed at the custom-house: that in December, 1808, the partnership of Humble and Holland was dissolved, and Holland entered into a new partnership with Williams, under the firm of Samuel Holland and Co. The name of the new firm was painted on the counting house, and the business of winding up the concerns of the old partnership was removed to another place. Holland and Williams repurchased the ship of Kinnard; and, on her return from the voyage on which he had sent her, they fitted her out in January, 1810, when the goods in question were furnished.—Upon these facts, considered without regard to the operation of these acts of parliament, it will be obvious, that Humble was not interested in the ship at the time when the goods were ordered, and was not one of the persons who gave the order, or who intended to be benefitted by the supplies that the plaintiffs had furnished. So that if he were chargeable for these goods, he could be chargeable only under the evidence of the certificate and its indorsements. And the court held that he was not chargeable. *Mac Iver and another* v. *Humble and others*, in the King's Bench, Trin. Term, 1812.

The case of *Pirie and another* v. *Anderson*, in the Court of Common Pleas, Michaelmas Term, 1812, was an action on a policy of assurance on a ship; the interest was averred to be in three persons. At the trial the ship's register was produced by the plaintiffs, and there was no sufficient proof of the interest averred unless this instrument was to be considered as *primâ facie* evidence of their title. No evidence was offered on the other side as to this point. Lord Chief Justice Mansfield permitted the plaintiffs to take a verdict, giving the defendants leave to move to enter a nonsuit; such a motion was accordingly made, and the court being of opinion that the ship's register was *not evidence of the title*, the rule for entering a *nonsuit* was made absolute.

2. Duty of a master.—If a master make any engagement or warranty without sufficient authority, from his owners, he is responsible to them for all injuries which they may sus-

tain in consequence; although the owners may be answerable to the persons with whom he contracts. Neither is he at liberty to enter into any engagement for his own benefit, that may occupy any portion of his time in other concerns: for, if he do so, and the price of such engagement happen to be paid into the hands of his owners, they may retain the money, and he cannot recover it from them:—Thus, the master of an English ship, being at Smyrna, entered into an agreement with the deputy commissary of the English army to let the ship to government for six months; and having stipulated that his owner should receive forty shillings per ton per month, he required that he himself should be allowed the usual primage. The commissary refused to make any allowance by way of primage, the freight being so very high; but, as he expected great assistance from the master's skill and activity in managing the transport service in that quarter, he agreed that, instead of primage, the master should be allowed one shilling per ton per month on the ship's tonnage. The ship remained in the Mediterranean under this contract for about nine months. The master might have obtained a cargo of merchandise at Smyrna, upon which he would be entitled to a primage of five per cent. on the freight: during the period of this engagement his personal exertions were of considerable benefit to the public service. The whole of the money was paid by government into the hands of the owner; and the master brought an action against him to recover this allowance. The cause was tried before Lord *Ellenborough*, in the Court of King's Bench, who said, "Is it contended that a servant, who has engaged to devote the whole of his time and attention to my concerns, may hire out his services, or a part of them, to another? It would have been a different thing, if the owner had been suing for this money; but I am clearly of opinion that, at all events, the present plaintiff has no right to it. Under this contract he must have been taken from superintending the defendant's ship; and I don't know how far it might go, if such earnings could be recovered in a court of justice. No man should be allowed to have an interest against his duty. I will assume that the plaintiff obtained as high a freight as possible for his owners, and that his services to government were meritorious; still there would be no security in any department of life or business, if servants could legally let themselves out in whole, or in part. My opinion upon the subject is quite decisive; and if it be doubted, I beg that a bill of exceptions may be tendered; *Thomson* v. *Havilock*, 1 Campbell, 527. Upon the recommendation of the chief justice, the owner consented to make the master some allowance in the nature of primage. But he could not have insisted upon this.

Upon the principle of the preceding case it was ruled by

Lord Ellenborough that a premium received by the master of a ship from the state of the exchange, in respect of a bill drawn by him upon his owners, on the ship's account, belonged to the owners; although it was suggested that in practice the master was allowed to retain a profit of this kind for his own use. *Diplock and others* v. *Blackburn*, 3 Camp. 43.

3. Breach of contract by charter party.—A merchant covenanted by charter party to load a full cargo at Jamaica for London, and to pay full freight at the rate of ten shillings and sixpence per hundred weight. His agent tendered a cargo of sugar, but insisted that the master should sign bills of lading for it at the rate of ten shillings only. The master refused to do so: and an action was brought against the merchant for not furnishing a cargo. It was urged on his behalf, that the master ought to have taken the cargo on the terms proposed, and that no prejudice could thereby have arisen to the owner, because he might still sue the merchant for the full freight according to the charter party. But Lord Ellenborough held that the master was not bound to take the cargo on these terms, because by so doing he would have been under an obligation to deliver the goods to the holders of the bills of lading upon receiving the lower freight, and would have lost the benefit of his lien upon the cargo for the higher freight mentioned in the charter party. *Hyde* v. *Willis*, 3 Camp. 202.

4. Freight, payment of. If a consignee receive goods in pursuance of the usual bill of lading, by which it is expressed that he is to pay the freight, he by such receipt makes himself debtor for the freight, and may be sued for it. But a person, who is only an agent for the consignor, and who is known to the master to be acting in that character, does not make himself personally answerable for the freight by receiving the goods, although he also enters them in his own name at the custom-house; *Ward* v. *Felton*, 1 East, 507. In a case where the consignee, known as such to be the master, sold the goods before they were landed, and the buyer received them, and entered them in his own name at the custom-house, it was once held by the late Lord Kenyon that the consignee only, and not the buyer, could be sued for the freight; but the point, having been since more maturely considered, has received a contrary determination. The master of a ship called the Whim, signed a bill of lading, importing that the goods had been shipped at Alicant for London, by Montgomery and Co., to be delivered to Hargrave and Dalzel of Algiers, or to their assigns, *he, or they, paying freight for the goods as customary with primage and average accustomed.* Hargrave and Dalzel indorsed the bill of lading for delivery to Peters of Gibraltar, and he again indorsed it for dellvery to Taylor and Son, of London. Peters was their

general agent at Gibraltar. The goods were cleared and entered at the custom-house by a brother of Taylor and Son, in their name. No demand of the freight was made at the time of the delivery of the goods; an action was afterwards brought for it by the owner of the ship against Taylor and Son. At the trial before Lord Ellenborough, it was objected that the action could not be maintained against *them*, who were mere purchasers from the original consignees, and it was contended that there was no contract either express or implied between *them* and the owner: though it was admitted that the master might have detained the goods for the freight. But his lordship was of opinion that, although there was no original privity of contract between these parties, yet the taking of the goods by the purchasers under the bill of lading *was evidence of a new agreement* by them, as the ultimate appointees of the shippers, to pay the freight for the carriage of the goods, the delivery being only stipulated with the shippers to be made to the consignees named in the bill of lading or their assigns, *he or they paying freight for the same.* The plaintiff thereupon obtained a verdict, and the case being afterwards submitted to the Court of King's Bench, the court confirmed the opinion delivered by his lordship at the trial; *Cock* v. *Taylor and another*, 13 East, 399.

It is to be observed that, in this case, *Cock* v. *Taylor*, the defendant took the goods under, and by virtue of, the bill of lading, that being the only instrument which gave him authority to claim them. In a subsequent case, *Wilson* v. *Kymer and others*, which came before the Court of King's Bench on a motion for a new trial in Michaelmas Term, 1812, and was an action for the freight of goods brought from the West Indies on board the ship Harmony, it appeared, that the goods were originally consigned to Williams and his partner, and the bill of lading was for delivery to them. At or about the time of the ship's arrival in the river Thames, the consignees pledged the goods with the defendants, who were brokers in very extensive business, and indorsed the bill of lading to them. The defendants entered the goods at the custom-house in their own name, which was represented to be a common practice with brokers. The ship went into the West India Docks to deliver her cargo, and the goods were entered in the books of the dock company, in the names of the original consignees, in correspondence with the entries in the ship's manifest, and according to the usual practice at these docks, when the master does not desire them to be entered in his own name. After the entry had been made at the custom-house, and the ship was in the dock, Williams and his partner, the consignees, gave the defendants an order upon the dock company to deliver the goods in question and other goods to the defendants. The defendants sent the order to the

company, and obtained the goods. It was said, that the company were in the practice of delivering goods upon the production, either of such an order, or of the bill of lading. But, in fact, the indorsed bill of lading did not appear to have been produced at all by the defendants. At the trial before Lord Ellenborough, the plaintiff obtained a verdict upon the authority of the case of *Cock* v. *Taylor*. Upon the argument in court, some of the judges thought the defendants had obtained the goods under the order of the consignees, and not as indorsees of the bill of lading; and that, in this respect, the case differed materially from *Cock* v. *Taylor;* and a new trial was granted, that the case might be more fully investigated. In the course of the argument, some discussion took place on the effect of the local acts of parliament, which oblige ships coming from the West Indies to London to deliver their cargoes in the West India Docks; and the 39 Geo. III., c. 69, s. 37, p. l. and p. and the 45 Geo. III., c. 58, s. 15, p. l. and p. were particularly referred to. The latter of these acts referring to the 44 Geo. III., c. 100, s. 6, which provides for landing and warehousing goods, not duly entered at the custom-house within a limited time, and for selling those upon which the duties are not paid within a further limited time, enacts, that goods so landed and warehoused shall be subjected to the same lien for freight, in favour of the masters and owners of the ship, as they were liable to while on board the ship; and directs the company, upon notice in that behalf given by the master or owners, to detain the goods until the freight shall be paid. This clause, in its terms, is confined to a particular case. But Lord Ellenborough and Mr. Justice Le Blanc expressed it to be their opinion, that as the legislature compelled the master to land his goods in these docks, the principles of the common law would reserve to him his lien upon them, if he chose to give notice of his wish to retain it, without any statutable enactment for that purpose.

5. Bills of lading and stoppage of goods. If the assignee of goods takes the assignment *bona fide* without notice of any such circumstances as would render the bill of lading not fairly and honestly assignable, he acquires a good title against the consignor. Goods sold are seldom actually paid for in money at the time of their shipment: in general a bill of exchange is drawn for the price. If a person knowing that such is the transaction, and that the bill of exchange has been accepted, takes an assignment of the bill of lading fairly and honestly for a valuable consideration, before the money becomes payable, without any reason to know or apprehend that the consignee is likely to fail and not to pay the money in due course, the consignor cannot prevent the delivery of the goods. This has been solemnly decided in the Court of King's Bench. But,

if a person assists in contravening the actual terms of the sale on the part of the consignor, or his reasonable expectations arising out of them, or his rights connected therewith; if, for instance, he knows that the consignee is in insolvent circumstances; that no bill has been accepted for the price, or that being accepted it is not likely to be paid; he will stand in the same situation with the consignee, and his interposition under such circumstances being in fraud of this right of the consignor, will not be available to defeat it; *Coming* v. *Brown*, 9 East, 506. So if he intervenes after the purchase, and makes himself a partner in the transaction with the first buyer, and engages as between them two to pay for the goods, he cannot prevent the exercise of this right, although he may previously have accepted bills drawn upon him by the buyer to a great part of the amount of the price; *Salomons* v. *Nissen*, 2 Term Rep., B. R. 674.

A bill of lading was specially indorsed for delivery of the goods to one Vass, if he should accept and pay a bill of exchange drawn upon him, and if not, then for delivery to the holder of the draft. Vass accepted the draft, and then indorsed the bill of lading to another person for a valuable consideration, but he did not pay the draft when it became due. Lord Ellenborough held that this special indorsement made it incumbent on the purchaser to ascertain whether the draft had been actually paid; and that he had no title to the goods. *Barrow* v. *Coles*, 3 Camp. 92.

See farther, on this subject, Mr. Abbott's Law of Merchant shipping, p. 399.

Deviation. In the Court of King's Bench, Guildhall, London, Jan. 22, 1810, before Lord Chief Justice Ellenborough, the case *Phelps* versus *Aldgoe*, was an action brought to recover on a policy of assurance, effected on the cargo of the ship *Margaret and Anne*, while at Iceland, and on her return to the port of London. It appeared that the ship was burnt to the water's edge on her homeward bound passage, and that the goods received considerable damage. In defence, it was set up that the ship had deviated from her voyage, as specified in the policy, and that there was unnecessary and unusual delay in getting the cargo. In the first place a deviation took place on the 1st of August, when the ship got under weigh, from her moorings, at Iceland, and went in pursuit of a strange sail, supposed to be an enemy's vessel: secondly, that the loading of the cargo was delayed, by a number of the men going on shore to plunder the inhabitants. It was admitted on the part of the plaintiff, that he did get under weigh on the 15th of August, and gave chase to a strange sail, but it was by the order and under the direction of Capt. Jones, commander of his Majesty's

ship *Talbot*, who sent his first lieutenant, of the name of Stewart, on board the *Margaret*, for the purpose of getting her under weigh. It was also admitted, that a certain proportion of the crew were sent on shore armed, not to plunder the inhabitants, but to protect themselves while getting wood, &c.; but that there was always a sufficient complement of men left on board to take in the cargo, as the crew consisted of 26, when 14 would have been sufficient to navigate her.

Lord Ellenborough observed, he was of opinion, that the orders given by Captain Jones, for the pursuit of the enemy's ship, were not such as the master of the *Margaret and Anne* was necessarily bound to comply with, and of course it made a deviation in the original intention of the voyage.

Under these considerations the plaintiff was nonsuited.

Another case, *Phelps* versus *Pratt*, which was a similar action, was, of course, decided as the former.

Freight. King's Bench, Guildhall, London, July 27, 1810, before Lord Ellenborough: the case of *Osgood* versus *Croning*. This was an issue directed by the Lord Chancellor, to try whether the plaintiff was entitled to freight on a cargo of sugar and rice, from the port of Charleston, in the United States of America, to the port of London, under the following circumstances:—The plaintiff and defendant are both citizens of America; the first the captain of the ship *Neptune*, and the latter a merchant in New York. The defendant chartered the ship to proceed to Charleston, and take in a cargo of sugar and rice, and from thence to proceed either to Tonningen, Amsterdam, or Rotterdam. She was taken at sea by one of his Majesty's cruisers, and sent into Plymouth, but was afterwards released. When the ship left the United States, neither of the parties were aware of the orders in council of this country, or the subsequent decree of France. The plaintiff, on being made acquainted with the nature of them, applied to the agents of the defendant, in London, for their advice. It was just after the bombardment of Copenhagen, which made all the ports in the Baltic suspicious of admitting vessels from England into their harbours. The agents recommended him to wait, and try to get a license from this government to go to Rotterdam. After having delayed some time without being able to get a license, he was ordered by the agents to proceed to Rotterdam. He took advice, and was firmly persuaded if he did, his ship would be confiscated: a circular letter from the American consul in Hamburg confirmed that opinion. He was then advised to take advantage of the order of council, which directs that all neutrals should touch at a British port, enter her cargo and pay duty before she proceeded to the harbours of the enemy; he accordingly entered his cargo, and wrote to his owners in Ame-

rica to know how to proceed. For the safety of the cargo he deposited the sugar in the stores of the West India Docks, and the rice in that of the London Docks. The moment the cargo was landed, the agents for the defendant served the plaintiff with notice to proceed to Tonningen, and on the day following served him with a bill in chancery to get possession of the cargo, which was ordered to them by the Lord Chancellor, he directing the present issue, for a jury to determine whether the plaintiff was or was not entitled to freight.

Lord Ellenborough observed, it was very clear that the plaintiff was not entitled to freight as the terms of the charter deed had not been fulfilled by him: it might be severe, but when two great nations were at war, those who wish to accumulate wealth by their calamities must run a risk, and should not complain that they had suffered a little by the nature of the warfare.

The verdict was, therefore, for the defendant.

DEVIATION. In the Common Pleas, August 2, 1810, before Lord Chief Justice Mansfield, the case of *Hodgerdorn* v. *Allmet*, was an action on a policy of assurance, effected on the 13th of December, 1809, on thirty chests of sugar, shipped on board the *Vrow Alida*, bound to Tonningen, with liberty to touch at Heligoland.

It appeared that the vessel sailed from Sheerness on the 16th of December, with convoy; the weather, however, being very bad, they parted convoy the day after their departure; on the 22d of December, the vessel arrived at Heligoland, where they took on board a pilot, and proceeded for the Eyder; at the mouth of that river they were obliged to cast anchor, in consequence of the tempestuous state of the weather, and the difficulty of the navigation; the entrance of the Eyder being full of sand banks, which were constantly shifting: finding it impossible to go up the river, they returned to Heligoland; here they took on board another pilot, and on the 30th of December they again weighed anchor for the river Eyder. The weather was very favourable in the morning, but about eleven o'clock it began to blow very hard, with much snow and rain, and the pilot, not being able to find the mouth of the Eyder, advised the captain, as the vessel was leaky, and had received much damage in her bowsprit and sails, to enter the Elbe for present safety, and to have her damages repaired: this advice was complied with, and they proceeded up the Elbe. On the 31st the weather moderated, and had the vessel been in a condition to go to sea, they might have returned down the Elbe: in the afternoon of that day, however, they were captured by the Danes, and carried up to Glückstadt: here the crew were confined separately, and treated with great inhumanity, to make

them confess, from whence the vessel came, the captain having originally stated that she was bound from Amsterdam. The men, worn out with hunger, at length confessed the truth, and the vessel was of course condemned.—This statement was made by the captain and mate of the *Vrow Alida*.

The payment of the insurance was resisted, on the ground that the captain, although he originally might have gone into the Elbe, for safety, yet, on the morning of the 31st of December, could have returned to Heligoland, and pursued his original destination; instead of which, having missed the Eyder, he thought he might as well sail up the Elbe, and vend his goods at Gluckstadt, which constituted a deviation from the original course specified in the policy of assurance.

No evidence was adduced in support of the defence, and the jury returned a verdict for the plaintiff.

Deviation. On the day last mentioned, and in the same court, the case of *Gardiner* v. *Senhouse*, was an action brought to recover damages on a policy of assurance. The cause had been tried last term, and a verdict given for the plaintiff, with leave to move for a new trial. The policy was on the ship *Good Hope*, bound on a trading voyage from London to Trinidad, and from thence to all or any of the ports of discharge on the Spanish Main; with liberty of calling at any of the British settlements or islands, in the course of her voyage to the Spanish Main, with the exception of Jamaica and St. Domingo.

The vessel, it appeared, had gone to Demarara, and from thence to Martinico: from the latter island she sailed for St. Thomas's where she was lost on the Anegada Reef. The policy had been laid before some high law authorities, since the last trial, and they had decided, that "the liberty of calling at the British settlements and islands" only related to such settlements and islands as lay in her direct course. The whole question, therefore was, whether St. Thomas's could be considered as lying in the direct and seamanlike course of a vessel bound to the western part of the Spanish Main? To ascertain this fact, three captains who had been many years in the West India trade, were examined. Two of them stated, that St. Thomas's was certainly considered out of the way of the direct voyage; the third did not conceive that it was a deviation so great as his brother captains seemed to think: they all, however, agreed that the voyage to the western part of the Spanish Main, by St. Thomas's and the other Islands, was much more secure than by going along the eastern shore of the Spanish Main; because, in the first instance, by sailing among the islands, they were sure of a steady wind; while, in the second, they were subject to light variable winds and calms.

It was stated, on the part of the defendant, that the bare ex-

ception of St. Domingo and Jamaica, contained in the policy, sufficiently evidenced the spirit in which the vessel was under-written. If those who under-wrote her intended that the voyage should be along the Eastern Coast of the Spanish Main to the place of her destination, the mention of those islands was quite unnecessary, as in that case, the ship would have been at an immense distance from them; but, on the other hand, they were in a direct line with St. Thomas's to which island the vessel had sailed.

Lord Chief Justice MANSFIELD observed, that, when the cause was tried, in a former term, he had given the policy a greater latitude than he now thought it would bear. The liberty of calling was evidently restricted to the islands in her direct outward bound course. He had, at that time, also imagined, that St. Thomas's was not so far out of the way of the regular voyage, as he now understood it to be. The plaintiff's witnesses, instead of proving that St. Thomas's was in the direct course, had deposed directly to the contrary. The jury, however, being conversant in matters of that nature, would, no doubt, decide correctly.

The jury retired, and, after half an hour's consideration, found for the plaintiff—Damages, 187*l.* 5*s.* 3*d.*

On the 7th of November, 1810, the defendant's counsel moved for a rule to show cause why a new trial should not be again granted, on the ground that the jury had found a perverse verdict contrary to the direction of the court, and had construed the policy of assurance improperly; having given to it a latitude which, in fact, it would not bear. On this occasion the chief justice said "There must be a rule to show cause. The court were perfectly in possession of the merits of the cause. I recollect the feeling by which I was influenced when I practised at the bar, and had I been counsel for the plaintiff in this cause, I should, after the court had stated its opinion, have agreed that my client should be nonsuited, and not have trusted to the prejudice of a jury. I do not mean to insinuate any thing against the jury who pronounced the verdict in this case; they, like other men, have their prejudices. These things are talked over at Lloyd's before they come into Court, and opinions are there given as to the meaning and intent of disputed policies, which, of course, must have some effect. It was supposed by the plaintiff, that there was a prejudice among the jury, and, therefore, the question was suffered to go to them. It had been attempted to be proved, that proceeding by the Virgin Islands was the way to Trinidad; but this was qualified by plaintiff's witnesses stating, it was the way according to the clause contained in the policy; and when I first read the policy, I supposed that it gave a latitude, which, on a subsequent examina-

tion, I found it did not possess.—If the same conduct is to be pursued by the plaintiff's counsel, and that a little prejudice exists among the jury, the defendant will gain nothing, ultimately, by this application.—However, take the rule."

Peril of the sea.—In the Court of Common Pleas, November 7, 1810. *Thomson* versus *Whitmore.* The plaintiff had been nonsuited in this cause, in the preceding term, a point being reserved for the consideration of the court.

Mr. Sergeant Lens stated, that this was an action upon a policy of insurance on the ship *Collingwood*, which was in the service of government; and, on her voyage from Lisbon, had arrived at Stoke's Bay, when it was found necessary that she should undergo some repair; she was accordingly laid down on Gosport Hard, where, in the course of a tide or two, from her shoars giving way, or some other cause, she had sustained considerable damage—the question was, whether this could be called *a peril of the sea*, within the meaning of the policy? His lordship had, on the trial, expressed a contrary opinion.

Lord Chief Justice Mansfield,—"I think this cannot be called a peril of the *sea*, when, for the purposes of repair, the ship had been taken from the sea, and placed upon land."—The original nonsuit was of course confirmed.

Demurrage (West India Docks).—Common Pleas, November 7, 1810. *Cholier* versus *Yates.* The defendants' counsel, in this case, moved for a rule to show cause why the verdict obtained last term in this cause should not be set aside, and a nonsuit entered. The plaintiff had brought his action for demurrage, under the following circumstances:—A quantity of brandy had been shipped on board his vessel, but the bills of lading had not been made out in the common form, a clause having been inserted, stating that the puncheons, &c. should be taken out in twenty days after the arrival of the vessel, or the owner of the brandy to be liable to a charge of 4*l.* per day, demurrage. The vessel was lying in the West India Docks, and, by the provisions of the act regulating the unloading of vessels there, which must be complied with, a delay took place, for which, as the defendant could not prevent it, he was not answerable. In many instances also, the state of the country might prevent a speedy unloading of the ships in the dock; which, from various causes, may at times amount to a much greater number than at others; and if delay were occasioned by such unavoidable circumstances, it did not come under the agreement contained in the bill of lading. If the verdict were allowed in this case, every trader who had goods on board this ship would be liable.

Lord Chief Justice Mansfield,—"Besides the defendant, there are, I believe, two defaulters, from whom the plaintiff

also has a right to recover. People ought to guard against the recurrence of this circumstance in future charter parties and other instruments. They may agree or not, as they please, to pay demurrage, when they are prevented from unloading by the crowded state of the docks."—Rule granted.

Bills of lading.—In the Court of Common Pleas, Aug. 2, 1810, the case of *Baddow* v. *Parry*, was an action on a policy of assurance for 250*l.* effected on a quantity of specie, to be shipped from Jamaica for England, on board "any one or more of his Majesty's ships."

It was stated, that six chests of dollars had been put on board his Majesty's schooner, the *Rook*, commanded by Lieutenant Lawrence of the Royal Navy. On her voyage to England, at a short distance from Jamaica, the *Rook* fell in with a French force, greatly superior, and, after a gallant action, in which Lieutenant Lawrence was killed, and the greater part of his crew, consisting only of twenty-five men, were killed and wounded, the *Rook* was captured.

Mrs. Lawrence, the widow of the brave lieutenant who commanded the Rook, stated, that the schooner carried six guns; she was pierced for two, but mounted four more on deck.

The counsel for plaintiff (Mr. Serjeant Shepherd,) *wished to put in the bill of lading, for the purpose of proving his client's interest in the specie shipped on board* the Rook.

Lord Chief Justice Mansfield would not, however, permit it; and Mr. Shepherd not having any other means of verifying the fact, the plaintiff was nonsuited.

Droits of admiralty. King's Bench, August 4, 1810. Case of *Routh* v. *Janson*. This was an action on a policy of assurance of ship and freight of the Danish ship Knua Teckleston, on a voyage from Corunna to the port of London, and lost on the French coast.

The ship in question had been detained by the commander of the Duchess of Bedford hired armed brig, just previous to the commencement of hostilities between this country and Denmark; and while the ship in question was detained, the King's proclamation issued, directing all commanders of his Majesty's ships and armed vessels to attack, capture, and destroy all Danish ships, &c. The ship and freight were insured for 3000*l.* against all risk, for the benefit of those who might be interested therein; and an action was brought against the underwriters, in the name of the captors; but they not having a legal interest vested in them (the ship never having been condemned as lawful prize,) that action fell to the ground, and the present action was brought at the suit of his Majesty, who, it was contended, held the legal interest as droits of admiralty.—The chief question, therefore, was, whether his Majesty had such legal in-

terest in this ship as enabled him to maintain the present action?

Lord Ellenborough was decidedly of opinion that the legal interest was vested in the King, as droits of admiralty; but, at the desire of the defendant's counsel, and with the permission of the court, the jury found a verdict for the plaintiff, subject to a case reserved for the future opinion of the judges.

CAPTURE. King's Bench, Guildhall, March 8, 1811, *White* v. *Inglis*. This was an action on a policy of assurance on goods from Yarmouth to Heligoland, insured against loss by capture of the enemy.

Mr. Garrow stated, that he understood that in the defence to this action it was not to be contended that the loss did not accrue by capture, but by sea-risk, under the following circumstances:—The ship sailed from Yarmouth, but meeting with bad weather, she ran aground near the Danish coast. She received, however, so little damage, that at the return of the tide she floated, and was about to proceed on her voyage. At that time the Danes were a little angry at some small disturbances we had occasioned at Copenhagen, and being on the look-out for stray merchant ships, they discovered the one in question, and sent out two armed boats, who took possession of her, and carried her into a Danish port; yet, he understood, it was to be contended that this was not a capture by the enemy. He then called the supercargo, who proved the case as stated by Mr. Garrow. He said the goods were put on board in London; that he joined the ship at Yarmouth, whence they sailed on the 26th of October.

Mr. Marryatt, for the defendant, contended, that the words in the policy, "in goods from loading thereof on board the ship," implied that they were to be loaded at Yarmouth, and that it did not cover goods loaded at London.

Lord Ellenborough held that it was sufficient if they were on board at Yarmouth. Verdict for the plaintiff.

DETENTION. In the King's Bench, *Moorson* v. *Greaves*, April 30, 1811. This was an action upon a charter party on the ship the Crown, at and from the port of London, with a cargo of provisions, to the island of St. Domingo; to which the defendants pleaded several issues; and, lastly, a set off on an account.

The ship in question sailed from the port of London, with a supercargo (Mr. Kane,) who had the whole superintendence of the voyage and disposal of the cargo. Mr. Kane was landed at Port-au-Prince, and the ship was sent off by him to Cape Nicola Mole (which was at that time in possession of Petion, and in great want of supplies,) in the hope of disposing of the cargo at a considerable advantage. The vessel was detained off Cape

Nicola Mole by some of Christophe's cruizers, who had interdicted the landing of any provisions in that part of the island, in order to distress Petion. The vessel was obliged to return to Port-au-Prince. The supercargo being disappointed at this proceeding, ordered the captain peremptorily to return to Cape Nicola Mole, and there dispose of the cargo at the best advantage.—The ship accordingly returned to Cape Nicola Mole, and was again detained by Christophe's cruizers for a few hours, and falling in with a British ship of war who detained her 48 hours, she was obliged ultimately to relinquish the adventure and go back to Port-au-Prince, where the cargo was finally disposed of; and the ship completed her voyage back to the port of London. While at Port-au-Prince the captain died, and a delay of a fortnight took place before another captain could be obtained.

Mr. Attorney General, counsel for the defendant, contended, that circumstances had occurred which interrupted the voyage, which the defendant was not answerable for, and therefore the plaintiff ought not to recover. During the time she was detained by Christophe, she could not be used by the defendant, and he was not bound to pay for that period, or the time she was delayed for the want of a captain. He did not deny but the defendant was liable for something, but he was not for the delay occasioned by these two occurrences.

Lord Ellenborough observed, that until the adventure was entirely abandoned, the ship must be considered as in the service of the party who hired her, and a *temporary detention* which might be the cause of the suspension of the voyage according to the charter party, could not be considered as an *abandonment* of the adventure. The only difficulty his lordship felt, was to discover where there was such a distinction as would give them grounds on which they could claim an exemption. His lordship, therefore, directed the jury to find a verdict for the plaintiff, which was according done, the damages being referred to arbitration.

DEVIATION. In the King's Bench, July 25, 1811. *Thompson and others* v. *Swansey*, &c. This was an action to recover 100*l.* upon a policy of assurance, at 18 guineas per cent. premium, upon the ship Gud Huffnan, at and from Riga to any port in the United Kingdom. The vessel sailed from Riga on the 15th of October, 1809, and in the prosecution of her voyage she met with extremely bad weather, by which she suffered very considerable damage, and was obliged to put into Rostoff to be repaired; but when she arrrived there, it was found that her cargo, which consisted of hemp and linseed, was also damaged, insomuch, that upon unloading the vessel for the purpose of repairing her, the cargo was found unfit to be reshipped. It was,

therefore, thought advisable to ship at the harbour a cargo of wheat in lieu of the hemp, which shipment was effected in the space of two days after the repairs were completed; whereas the hemp could not have been reshipped in less than four or five days more. In the course of her voyage she was captured by a Danish privateer, and the owner now sought to recover the loss from the underwriters.

Although this policy contained a liberty to load and unload, at any port in the Baltic, Sweden, or Russia, where necessity might oblige her to touch, yet it was argued for the defendants, that, by converting the cargo from hemp into wheat, the owners could not recover upon the assurance for a capture in the subsequent part of the voyage.

The question, therefore, was, whether a ship which was forced by necessity into a port, out of her regular course, could be entitled to turn her original adventure into another and a new adventure, there being an express permission to go into any port or ports during the voyage, exclusive of the existence of that necessity, which compelled her to make the harbour of Rostoff?

Lord Ellenborough thought, that as the plaintiffs had a power to load and unload by the terms of the policy, they had also the power to do so at the port into which they were driven by necessity. It was, however, somewhat a new case; but by the terms of the policy the plaintiffs were entitled to recover. Verdict for the plaintiffs, 100*l.*

Abandonment.—*Martin and another* v. *Crokatt*, King's Bench, July 25, 1811. This was an action upon a policy of assurance brought by the plaintiffs, who were naval officers in his Majesty's service, to recover 7500*l.* for the loss of a prize, called the San Nicolas, which they, by their vessels, the Implacable and the Melpomene, had taken in the Baltic. This prize was a Russian vessel, laden with spars. When they were navigating her home, she was unfortunately run foul of by another vessel, by which accident she was considerably injured, and all the naval skill of the captors could scarcely keep her above water with safety to the crew. At length they succeeded in getting their prize into Warburg, in Sweden, where, upon examination, she was found to be in a state totally incapable of repair, and even if it had been otherwise, the means could not have been procured. The next object of those concerned was to get the cargo home in another ship; but, in the then state of the Baltic, and the warfare there carrying on, that too was found utterly impracticable: the vessel lay sunk in the mud, and it became necessary to dispose of her; by that disposal the captors were left with no proceeds whatever. The plaintiffs had effected the assurance through Messrs. Cooke and Halford,

their agents, and they were desirous to inform the underwriters that the vessel remained at their risk; but, upon its being so intimated to them at Lloyd's, they answered that it was not a case that admitted of abandonment.

It appeared from the evidence of Mr. Halford, the navy agent, that he had lost no time in making the necessary communication to the defendant; but the letter he had received, on the 28th of October, from Captain Martin, at Gottenburg, did not authorize him to state that a total abandonment had taken place: upon which Mr. Crokatt, and another of the underwriters, told him he must act as if the vessel were not assured, and that they regretted the loss, as it was an unfortunate case. He took other advice, and found it coincided with theirs; upon which he wrote to Mr. Picknell, the prize agent at Gottenburg, upon the 17th of October. The vessel was soon afterwards sold, and reckoning all expenses, there was a loss to the captors of 20*l.* A formal abandonment had not been intimated, because Mr. Halford was persuaded, by the opinion of the underwriters he had consulted, that it was not a case which admitted of it.

Lord Ellenborough expressed his sorrow that there had not been a *specific order for abandonment* intimated to the underwriters, for then the plaintiffs would have been entitled to claim for a total loss; but as it was, it amounted only to a case of *average.* Under the circumstances of the case, it could not be deemed a total loss *quoad* these underwriters, and therefore he directed the jury to find for the defendants.—Verdict for the defendants.

Licenses.—In the Court of King's Bench, Guildhall, London, July 26, 1811; the case of *Blackburn* and *Stocks* v. *Thomson*, was an action to recover 200*l.* upon a policy of assurance on the ship *Elizabeth and Mary*, at 15 guineas per cent. from London to Hayti, in the island of St. Domingo, and dated the 21st December, 1807. Those parts of St. Domingo which are under the dominion of Christophe, have been recognized by several orders in council as neutral, and there is therefore no illegality in the trade to them. It has been repeatedly declared lawful. This vessel first went to Cape Francois, which is under the dominion of Christophe, where she sold to him about one fifth of her cargo, and contracted with the adjutant of Christophe to deliver the remainder at St. Marks, off which place she was met by Captain Warren, of the *Dædalus*, who, supposing she was upon some illegal traffic, seized and detained her. She was carried to Jamaica, where she was libelled, and condemned in the Vice Admiralty Court. The owners appealed to the King and Council here; and, after the cause was heard at the Cockpit, the sentence of condemnation was reversed. Upon

this last decision the plaintiffs now sought to recover against the underwriters. An error has obtained that the assured cannot recover against a British capture; but that only holds good where it is a legal capture. In this it was alleged to be illegal. The vessel sailed from the Downs on the 28th of January, 1807; arrived at St. Domingo on the 6th of January, 1808; sailed for St. Marks on the 2d February following; and was captured by the *Dædalus* next day.

On the part of the defendant, it was argued, that the owners had not conformed themselves to the license they had obtained, for there were French wines on board, which was an article not permitted, and also that she was going to an enemy's country: for, at the time the seizure was made, there was nothing in the orders of council to show that Hayti was not a hostile place.

Lord Ellenborough thought that the most potent authority was the declaration of the state upon the subject: and, when he found that it had recognized that place, which was originally hostile, to be of a neutral character, it was incumbent upon courts of law to recognise it also. The order of council of the 15th of July, 1807, although for the indifferent purpose of legalizing the trade from Nova Scotia to such ports of St. Domingo as were not in the possession of France, yet by that he found a recognition that there were certain parts of that island not under that dominion. Besides this, the court of appeal, having had the grounds of seizure before them, and having reversed the sentence of condemnation of the vice-admiralty court, the argument as to French wines being on board was thereby done away. He could not but consider that a voyage so prosecuted, and a seizure so made and restored, amounted to a recognition of its legality.—Verdict for the plaintiffs.

On the 12th of November, 1811, Mr. Carr, counsel for the defendant moved for a rule to show cause why the verdict for the plaintiff should not be set aside, and a new trial granted. He stated that both vessel and cargo were the property of the plaintiff. She sailed under a license from the British government, which permitted her "to take out to Hayti a lading of home manufactures, and East India produce," and she was to return with any cargo, the growth of St. Domingo, excepting cotton.—This license was only to protect the property of Mr. Blackburne, or of other British merchants, being of the description already mentioned. And should the vessel be detained by any British ship of war, and brought to trial in any court of admiralty or vice-admiralty, it was forthwith to be delivered up, on sufficient bail being given. The plaintiff shipped on board a cargo, consisting principally of British and East Indian

manufacture and produce. But he also put on board thirty-six pipes and several cases of claret, a quantity of Madeira, and a quantity of Dutch cheese. It was not clear whether he was justified in exporting the latter articles, under any order in council, but certainly he had no license for it. Part of the cargo was sold at Cape Francois, and the supercargo entered into a negociation with the agents of Christophe, for the disposal of the remainder, which was to be delivered at St. Mark's. On the vessel's voyage thither she was detained by his Majesty's ship *Dædalus*, on the ground, as the captain stated in the admiralty court, of those articles being found on board, which were not specified in the license. The ship was carried into Jamaica, and there condemned. The residue of the cargo was afterwards sold at a very great loss.

Lord Ellenborough—"Did any part of the vicious cargo belong to the plaintiffs?"

Mr. Carr—"Both ship and cargo belonged to the same party."—The learned gentleman contended, that, by putting on board these articles which were not specified in the license, the policy was avoided: because the plaintiff thereby subjected the ship to a rightful detention, which was admitted by the court of appeals. And, arguing on the same principle which his Lordship had supported (in the case of *O'Meara* v. *Lushington*,)* the plaintiff having by his own act, occasioned the loss, had no right to demand restitution from the underwriters.

Lord Ellenborough—"Show us how the *license* was necessary? Was the island of Hayti at war with this country? Did the objection proceed against the country, or against the cargo?"

Mr. Carr said, he contended, 1st, That the loss was occasioned by the plaintiff's own act, independent of any other consideration; and, 2dly, That the license was necessary. If he had adhered to the terms of the license, the vessel would never have been detained. The court of admiralty, it was true, had ordered a restitution of the goods; but that adjudication also gave the costs in both courts to the captors, which was not less than 52 per cent.

Lord Ellenborough again requested the learned gentleman to point out how the license was in the first place *necessary*. It was for the violation of the license the vessel had been detained. But, if a person put a *useless* document on board, it was not imperative on him to act up to its contents.

Mr. Carr said, the plaintiff having taken out the license, and not having complied with its provisions, the vessel was subject to capture. St. Domingo was at one time a colony of the enemy.

* This case is given hereafter.

Lord Ellenborough—"On this part of the subject we have too little communication. There certainly must be some order in council, permitting a trade with that country. I think Hayti is in the King's peace."

Mr. Carr said, that he had got the orders in council relating to the trade with Hayti, not one of which permitted it, generally, anterior to the shipment in the *Elizabeth and Mary*, which was on the 27th of October, 1807. St. Domingo having been a colony of the enemy, it must be conceded to him, that it belonged to the sovereign authority of the state only to judge when that or any other country assumed a friendly character. No individual had a right to decide whether a country were peaceable or hostile.—Mr. Carr then read the three orders in council, which had been promulgated on the subject of the trade of St. Domingo, anterior to the sailing of the *Elizabeth and Mary*, which, he contended, were limited, and did not sustain the plaintiff. The first was dated the 19th of November, 1806, which permitted commercial intercourse with the Bahama Islands, the island of Tortola, and such ports of St. Domingo as were not in the hands of the enemy. The 2d was dated the 11th of February 1807, and allowed vessels which had cleared out for Buenos Ayres, to touch at such ports of St. Domingo as were not in possession of the French or Spaniards. The third was dated the 15th of July, 1807, and permitted vessels from Nova Scotia to trade to those ports of St. Domingo which were not in the hands of the enemy. These were the only orders anterior to the shipment. But, on the 14th December, 1808, an order was published, extending the liberty of commercial intercourse, which he conceived was a proof that it had not been before permitted.

Lord Ellenborough—"That being posterior, cannot cover the anterior act. But I think it very strange that *licenses should be granted, when there were no orders in council* to support them. How came the restitution in the admiralty court."

Mr. Carr—"Most probably the court proceeded on those former orders in council; but, if so, they acted most erroneously.—Your Lordships, however, sitting in a court of law, will examine how far those orders in council extended."

Lord Ellenborough—"But, certainly, there are some other acts of state by which Hayti was considered as a neutral, if not a friendly power. I recollect a number of French prisoners having been brought by our vessels from Hayti. We were, I believe, co-belligerents."

Mr. Carr—"I know we took away the French garrison to save their lives: but I am sure there was no other act of state than those I have mentioned."

Lord Ellenborough—"It need not be by an order in coun-

cil: a country must be considered friendly, if it be recognized to be a co-belligerent."

Mr. Carr—"It remains with the other side, if that be fact, to prove it."

Lord Ellenborough—"You bottom yourself on the antecedent state of warfare between this country and France, in which the colony of St. Domingo was merged, and argue, that nothing had occurred, up to a certain time, to alter it.—*Certainly, if the license was necessary, the terms of it were not complied with.*—Take a rule."

LICENSES. Court of King's Bench, July 29, 1811; the case of *Flindt* v. *Bond* was an action upon a policy of assurance on the ship Lyna, dated 30th of August, 1810, from London to the Baltic, against all risks, and until the cargo should be safely landed and warehoused. There was likewise a clause, by which the underwriters undertook to pay, within two months, without waiting for any of the regular documents arriving from the country in which the loss took place, there being a doubt whether the vessel would be received at these foreign ports or not. The vessel proceeded from London to the Baltic on the 1st of September, and she was seized by the French off Schwinemunde.

Captain Grabb deposed, that he received a cargo on board the Lyna for Mr. Flindt, Mr. Grabbell of Stettin, and Mr. Sigismund Schaggell, of Breslaw, Prussians. He sailed from London on the day above-mentioned, and joined convoy at Sheerness. He reached Gottenburg, where he staid till the 24th of October, when he sailed, under the protection of a British ship of war, and proceeded through the Great Belt. There was a large fleet at Gottenburg, so that he could not get convoy sooner. He arrived in Schwinemunde Roads upon the 14th of November, and came to anchor there about four or six English miles from the land, and went ashore to the gentlemen to whom he was addressed. His papers were sent up to Stettin for examination, and he returned aboard the ship, to wait for orders. He did not see his papers again; but, two days afterwards, Prussian soldiers were sent on board, who took possession of the ship. Some days afterwards, the cargo was taken into lighters, and carried ashore; after which they got the ship into the harbour, where they again put the cargo on board; and, after it had remained there fourteen days, it was again taken possession of by the French, and they locked the hatches and sealed them. The vessel remained there frozen up until the winter was over, being during the whole time so guarded by soldiers, that he could not touch any part of his cargo. The ship was about 220 tons burden, and he could not have got it into the harbour until some part of her cargo was discharged,

and this is the case with most ships coming to Schwinemunde, which is the harbour of Stettin. There was a French privateer came and boarded them when the ship was in the outside of the harbour; but it was retaken by the Prussians, who then carried it into the harbour. He did not know that his consignees had got any part of the cargo. The vessel was condemned upon the 1st of April, by the prize court of Schwinemunde, after which he left that place and never got payment of his freight. There were a great many other ships seized in the same way, and they were all moored close together, and soldiers placed around to guard them. They could not have got away for these soldiers, as they would have fired upon them, and he understood they would have hanged them if they had opened the hatches.

The defendant's subscription to the policy of assurance was proved, and the policy read, as was also the license and order of council, signed by Mr. Secretary Ryder, dated August 2, 1810.

Mr. Topping for the defendant stated, that he was called upon to pay 500*l.* upon this policy. He should not enter upon the many frauds that now took place upon the Baltic risks, for the question merely was, whether, under all the circumstances of this case, the defendant, Mr. Bond, was liable to pay this loss in consequence of his subscription to this policy? The fact was, that the real plaintiffs in this case were Prussians, and it was surely a question whether, as the loss had happened through the conduct of that state to which they belonged, and in which they resided, the defendant or any subject in this country could be liable to indemnify them? He should argue that it could not be competent for the subjects of any state, the government of which has been the cause of the loss sustained, to call upon the underwriters to make good that loss. In support of this he cited the case of Conway and Gray. Mr. Bond had not agreed to indemnify Prussian merchants against the acts of the Prussian government. The value of the policy was 16,400*l.*, and there were many other underwriters whose interest depended upon this decision. The cargo having been first taken out by a strong Prussian force, the vessel was taken into the harbour and there reloaded, and could not be again got off without being lightened, in order to get over the bar. The loss, therefore, did not happen by means of the French, for the cargo was condemned in a Prussian port, and by a Prussian court. Although a French privateer had interposed to make prize of that ship and cargo, yet the Prussians drove them off, and resumed possession of it. When in the harbour, the hatches were sealed and watched by Prussian soldiers. To what therefore could this seizure be actually ascribed but to the act of the Prussian government? There had been no abandonment in

this case, but the ship and cargo had been wholly under the restraint and detention of the governing power of that country; and the plaintiffs, being subjects thereof—he should submit—could not recover from Mr. Bond. The utmost the license could do, was to give the assured a right to sue for losses by the ordinary perils of the sea, but not to sue in a British court of justice upon a loss occasioned by their own government.

Lord Ellenborough thought, that if at the moment when the ship and cargo had been taken possession of by a Prussian force, an abandonment had been made, he should not have had any doubt in calling it a Prussian seizure; or, if the last thing that appeared to have been done were the Prussian condemnation, he should have said that the loss was occasioned by the Prussians, as it would have been a confiscation by the Prussian government. The sentence of condemnation, however, not being produced, the jury must look to the last act of the French force, which was that of taking possession. It was a seizure by the French custom-house officers, assisted by a Prussian force. It appeared to him that a material fact was wanting, as the plaintiff had not produced the act of condemnation; but even if it had been produced, the question then to be considered would have been, whether a license granted by the British government, legalized such a trade, so as to give to a party a right to sue and recover such a loss? They could, however, only proceed upon the evidence which was before them; and, although the captain had said that he did not know whether the plaintiffs had their goods again, yet they were not to presume collusion, unless it were clearly proved by evidence; for otherwise no man would be safe in a court of law. Upon the whole circumstances, he should suggest the propriety of pronouncing a special verdict, so as to make it the subject of a case for the opinion of the court. Verdict for the plaintiff accordingly, upon the footing of its having been a French capture.

On the same day, the case *Flindt* v. *Read*, was an action against another of the underwriters, upon the same policy of assurance, and in which similar evidence was given, with this addition, that the sentence of condemnation was called for on the part of the defendant, and produced. It, however, made no alteration in the result; for the jury, under the direction of his lordship, gave a verdict for the plaintiff for 250*l.*

On the same day the case of *Flindt* v. *Barton* was another action upon the same policy, in which a verdict was given for the plaintiff, under a similar proviso, for 200*l.*

On the same day, the case of *Flindt* v. *Vaughan*, was a similar action upon the cargo of a vessel from Heligoland to Dantzic, which was taken possession of as above described. Verdict for plaintiff.

On the same day, several other cases, *Hulle* v. *Lee and others*, similar to the preceding, were disposed of in the same manner.

On the same day the case of *Flindt* v. *Andrews*, was an action upon a policy of assurance upon goods shipped per a vessel called the *Franchap*, from London to any port in the Baltic, at thirty guineas per cent. to cover all risks.

It appeared that this vessel and cargo were captured under similar circumstances. It involved this additional question, whether a license granted to a person in this country could cover another person who was not resident in this country. This matter had been very much considered by Sir Wm. Scott, who held that no license could be extended beyond the terms of it.

Lord Ellenborough thought that government, when they granted a license to a person for himself, and others, allowed him to select these others. There might be some difference observed in this respect, between exportation and importation; for the license might be narrower as to importation of foreign commodities than for exportation, for in that case the larger the license was the better for the purposes of the state. It was a case, however, which he would not decide here although he was for giving it the largest interpretation.—Verdict for the plaintiff for 350*l.* subject to a case.

But, on the 12th of November, Mr. Carr, for the defendant, moved for a rule to show cause, why the verdict for the plaintiff in this case should not be set aside, and a new trial granted. The action had been brought on a policy of assurance, effected on goods shipped on board a vessel, called the *Franchap*, from London to any port in the Baltic. The vessel had proceeded on her voyage, and was seized in Schwinemunde Road, on the 16th of November, 1810. The license under which the ship sailed, purported to have been granted on behalf of British merchants and others. And the question was, how far this license, granted to a person residing in this country, could cover an individual, the native of a foreign land, dwelling in a hostile country? Mr. Carr contended, that it could not have such an effect. The license was granted to a British merchant, and others, that is, *ejusdem generis*, and could not extend to a person residing at Hamburg, in 1810, situated as that place then was. To argue that such a license should give security to a person who might be considered French, was going farther than any *dictum* which had been yet delivered on the subject. There was no necessity that either a Frenchman or Hamburger should have been employed to carry on the trade. There was much dispute about the time when Hamburg became formally French; but he must argue, that when there was a French garrison in

Hamburg, although the shadow of the senatorial power might have been permitted, yet every person carrying on trade there, must be considered as a French subject; and the word others could not cover them. In the case of *Inglis* v. *Honington*, which was the first instance when the strict doctrine of licenses was departed from, it was decided, that a native of a foreign country might be secured under a license, because he could not carry on his trade else. But the license in the present case was granted "to British merchants and others," and this evidently meant persons residing in the same country. Sir W. Scott, who had paid great attention to the subject of licenses, had delivered it as his opinion, "that they were *stricti juris*—of high authority, and ought to be construed literally.

Lord Ellenborough—"I doubt whether they ought not to be taken in a larger extent than I have hitherto been willing to give them. They are necessary for carrying on the trade of the country, which could not proceed without them, as our commercial intercourse must unavoidably be with those who are more or less influenced by France. I do not know how to take from the word others its generality—I wish the license had been more advisedly and considerately framed."

The Attorney General—"The misfortune is this; the object of the government has been to enlarge these licenses as much as possible, and they have left the parties who applied for them to draw them up."

Mr. Carr—"If that be the case, the parties ought to be accountable for their own acts."—Rule granted.

FRAUD IN POLICY.—In the King's Bench, Nov. 12, 1811; Mr. Serjeant Pell stated, in the case of *Leach* v. *Dunsford*, that this was a writ of error, from the Court of Common Pleas. The action arose out of a policy of assurance, effected by the plaintiff, on goods on board "ship or ships," without mentioning their names. The plaintiff had shipped a quantity of goods on board a vessel called the *President*, on the 8th of October, 1808. The vessel was captured in the November following. On the 22d of that month, a paper was stuck up in Lloyd's, stating that the captain of a merchant vessel had passed the *President* at sea, and that she appeared "deeply laden and leaky." It did not appear by whom this notice was stuck up, but the information contained in it was false and unfounded. When the plaintiff brought his action to recover for the loss occasioned by capture, he was nonsuited, on the ground, that at the time of his effecting the assurance, he had not informed the underwriters that he had shipped goods on board the vessel stated to be in this perilous situation, which was the case. Sergeant Pell contended that this was not a material fact to be stated, because the information ultimately proved false. Had it turned out true, then,

beyond a doubt, it would have voided the policy, as was held in cases of *Da Costa* v. *Scandery*, Peere William's Reports, vol. 3, p. 170; and *Seyman* v. *Fenneral*, 2d vol. of Strange, 1183. The report, however, which was promulgated about the *President* had been disproved; and, therefore, he conceived the plaintiff's silence did not void the policy.

Lord Ellenborough—"He cannot be governed by the future event. He could not decide on the truth or falsehood of the statement at that time."

Sergeant Pell—"The report came in a very questionable shape; and a man is not bound to state every foolish report he hears."

Mr. Justice Le Blanc—"The plaintiff is not blamed for not stating the rumour, but for not communicating the fact that he had goods on board the vessel, and leaving it to the underwriters to apply the circumstance to the rumour."

Sergeant Pell then argued, that a person effecting an assurance was not bound to state a rumour which he knew to be false. If that were not necessary, had he not a right, when the report was doubtful, to take his chance for its being confirmed or disproved? If the former were the case, of course the policy would be voided; but, if the latter, he did not conceive the same effect should follow. Were a rumour to be stated to the underwriter, he would immediately presume it true, and conceive he had a right to increase his premium.

Lord Ellenborough—"According to your own argument, the assured and the underwriter do not, in the case you have stated, stand on an equality. If, when apprised of it, he would presume the rumour to be true, and, in consequence demand a greater premium, you, by concealing the fact, get the assurance effected cheaper; and his ignorance of your secret information, deprives him of the opportunity of making terms more commensurate with the supposed risk."

Mr. Justice Bailey—"Do you not take an advantage? You say you risk the chance; but you leave it to the underwriter to find out the circumstance of your prior knowledge, as he can."

Mr. Justice Grose—"It was a material fact, and ought not to have been concealed. It was material; because, having a knowledge of it, the underwriter would have been better able to judge whether he should assure the goods at all; or, if he did, what premium he ought to demand."—Judgment affirmed.

Changing ship's name, &c.—The case of *Minett* v. *Bruce*, in the King's Bench, August 1, 1811, was an action upon a policy of assurance, dated 12th June, 1810, upon goods by the *Vrow Wilhelmina*, at 14 guineas per cent. from London to the Baltic, and warranted from seizure in the port of delivery. The vessel was originallly bound to Stralsund, and about the 26th of

July she got to Istadt, where she waited for orders, and upon the 16th of August she sailed from thence for Warmund and the port of Rostock, at which latter place, when she had reached about the middle of the harbour, a boat came to her from the shore with some of those coasters, who act either as pilots or privateers, as the case may require. They took the captain on shore with all his papers, and, while he was absent, the mate, thinking the ship would soon be obliged to follow, raised anchor, and made sail for protection from an English frigate. The people on shore seeing this, endeavoured to stop the captain, but he succeeded in making his escape, and rejoined his vessel, which returned to Istadt, where they got fresh papers and new christened the ship. They next sailed for Koningsberg, in the end of September, but unfortunately before she reached that port she was captured and condemned. It was argued for the underwriters, that it was contrary to the policy that the ship should change her name; and that, although there was a power given for exchanging simulated papers, yet there was an irregularity in making assurances upon the original papers, which was the case in the present instance, so that any man might immediately see the deception that was practised and know the port from whence she came. It was alleged that the sentence of condemnation had proceeded from the inaccuracy of the papers so erased. Besides this, it was contended, that Lubec, the place to which she had gone, was not a neutral port, but under French government.

Lord Ellenborough thought that the owner of the goods did not engage to represent the vessel as being of any particular nation, and therefore the alleged ground of condemnation could not free the underwriters, and there was no evidence shown that Lubec was under the French government. Verdict for the plaintiff, 200*l.*

Deviation.—In the King's Bench, August 2, 1811; the case of *Tate* v. *Levi* was an action on a policy of assurance upon the ship *Catharine*, from Cork to certain ports in Spain, but not higher up the Mediterranean than Tarragona, which policy was subscribed on the 1st of August, 1810, by the defendant for 200*l.* at a premium of 15 guineas per cent. to return 3*l.* upon arrival. It appeared that this vessel stopped at Gibraltar, where she took in a quantity of staves and empty pipes, and soon afterwards sailed for Tarragona, off which place she arrived in the night of the 27th of November, within 25 miles, and hove to off the shoals, at the mouth of the river Ebro, for the purpose of making that port next morning. At that time the captain observed a light on shore from both the starboard and larboard bows; and, after having retired to rest for a few hours, leaving his mate upon the watch, he was astonished still to per-

ceive these lights in pretty nearly a similar situation: but it turned out that, during that night, the vessel had been drifted by a very strong current, and the captain soon afterwards found that he was entering Barcelona, instead of Tarragona, and did not discover his error until she was too far in to avoid a French force coming out and taking her. The captain of the vessel was a young man of 22 years of age, the son of the plaintiff, and never having been that same voyage before, was totally unacquainted with the strong current in that quarter of the world, but he was totally freed of any voluntary error. This present action was brought to recover the loss against the underwriters.

The defence set up was, that the underwriters had only assured the ship and cargo to the length of Tarragona, expressly excluding any port to the northeast thereof; whereas she had deviated to the distance of 36 miles.

After hearing the evidence of the captain, Lord Ellenborough observed, that he did not see a colour for the vessel being so far out of the limits prescribed by the policy; and that an entire ignorance of a prevalent current was not excusable, for he ought to have been furnished with something to give him instructions.—Plaintiff nonsuited.

On the 11th of November, 1811, the Attorney General moved for a rule to show cause why the nonsuit in this case should not be set aside, and a new trial granted. He remarked that there was no suspicion of fraud, and the question was, whether the underwriters were answerable for the loss of the ship, in consequence of the captain's mistake? He was aware that they were not answerable for *erassa negligentia*, but he did not think this was a case of that description.—Fraud was entirely out of the question, and it had never been fully decided that underwriters were not accountable for the negligence of the captain.

Lord Ellenborough here read part of the captain's testimony on the trial, by which it appeared that he had never been on the coast of Spain before. He had a chart but no book of instructions. He did not try to anchor off Tarragona, and was totally ignorant of the place. His lordship then observed, that if a man acted so imprudently, in a case of such extreme nicety, and the next to it was in the hands of the enemy, as to send out a person incapable of distinguishing the one from the other, he only had a right to suffer. He should have placed a proper master on board the vessel.

Mr. Justice Le Blanc—" It is something like a question of seawhorthiness, whether or not the ship is fitted out with a proper crew?"

Lord Ellenborough—" I said at the time, that the loss was not *ex justa causa*. When the whole anxiety of the underwriters was, that the vessel should not proceed further than Tar-

ragosa, a person had been sent out as captain who did not know that port from the port of Barcelona. He should have put out an anchor; he should have sent ashore; he should have done any thing rather than quit the place of his destination."

The Attorney General—"He says he was driven by the currents."

Lord Ellenborough—"He says he believes so, which is a very loose way of stating the fact. It is a loss not arising *ex justa causa*. It is going out of the prescribed limits, without an adequate reason being assigned; or it may be considered as originating in sea-unworthiness, an improper person having been put on board the ship."

Mr. Justice Le Blanc—"It appears to be an incomplete fitting out of the ship. As she was destined for a particular port, there should have been a proper person on board, to have distinguished it. From the want of such a person the vessel was carried into an enemy's harbour."

Mr. Justice Bailey—"I do not know how this case can be put on the ground of a deviation; because there was no intention on the part of the captain to enter any other port but that to which he was bound. But, on the other ground, that the loss arose from a want of competent knowledge and skill, I think the nonsuit must be supported."—Rule refused.

DEVIATION. In the King's Bench, August 2, 1811, the case of *Welsford* v. *Tunno*, was an action upon a policy of assurance upon a ship called the Alfred, which was lost by the perils of the sea, under very disastrous circumstances, and a claim was now made to recover the loss from the underwriters.

It appeared that this vessel had sailed on the 5th of April 1809, from this country to Prince Edward's Island, where she was to take in a cargo of timber; and the insurance was upon her homeward voyage, effected in July, that year. Upon her arrival there, most of her crew being indebted to the captain, deserted, as being the most effectual mean of paying their debts. Every exertion was used by the captain, and a son of the plaintiff, who was resident upon the spot, to procure a crew to load and navigate the vessel home, a task which was found to be very difficult. At last, upon the 18th of January, 1810, having got a sufficient number of hands, namely, twelve men, they sailed, with a pilot on board, with a fine fair breeze, and favourable weather. They proceeded on their voyage, with every prospect of getting home, but had not been long at sea before they encountered most desperate storms, attended with snow, so that it was impossible to keep the ships from being driven against islands of ice. Not only were their pumps frozen, but also the toes and fingers of the crew, so as to render them almost helpless. They succeeded, however, in saving

their lives, by having recourse to their boat, and reaching the nearest port.

The only one of the crew who could be got as a witness in this cause was the cook, who gave a description of dreadful hardships they endured, and verified the facts above stated.

In defence it was alleged that the underwriters had reason to expect, from the representations made to them by the broker, that the vessel would have set sail much more expeditiously, namely, in the fall of the autumn, and that they were not answerable for the delay occasioned by the desertion of the men. It was alleged, that it was next to madness to sail from that island at such a season of the year, when violent storms are known generally to prevail; for, had the ship been the strongest that ever was built, it was a hundred to one that she ever could arrive at her destined port.

Witnesses were called for the defendant, to prove that it was not customary to leave that and other such ports at so late a season of the year; but in that they totally failed, as, on the contrary, they proved that vessels had sailed even much later. Verdict for the plaintiff, 250*l.*

Simulated papers. Case of *O'Meara* v. *Lushington*, King's Bench, November 11, 1811. The Attorney General moved for a rule to show cause, why a previous verdict for the defendant should not be set aside, and a new trial granted. This action was brought on a policy of assurance, on goods from Gottenburg to a port in the Baltic. The words in the policy were, "beginning the adventure on the said goods from the time of their loading at Gottenburg." The fact, however, was, that the goods were not put on board at Gottenburg but at London. Thence, they were carried to the former place, and they were finally sent to Riga. When the vessel arrived there, her hatches were sealed down, and her papers taken away to be examined at Petersburg. The ship and cargo were subsequently seized on, and never restored. The first question was, whether she had been moored in safety for twenty-four hours; and by a decision of Chief Justice Lee, the "mooring in safety" was stated to mean the vessel being in a place where she might freely unload; which, undoubtedly, was not the case here. The next objection to the plaintiff's recovering was, that the vessel was provided with simulated papers, although by the terms of the policy she was not authorized to carry them. Those papers set forth that the vessel came from Bergen, and not from Gottenburg; and, when the ship arrived at Riga, those simulated papers were made the ground of her condemnation. But this fact should be recollected, that at the time the policy was granted, Sweden was at war with Russia; and, therefore, if the ship and cargo appeared to be Swe-

dish, they went to certain ruin at Riga. The assured, in consequence, as well for the protection of the underwriters as of themselves, procured those papers, as if the ship had come from Bergen. This, the attorney general contended, arose from prudential principles. In the same manner that a party assured, if, in the course of his voyage he met an enemy, would, for the purpose of deluding him, hoist a foreign flag, although no provision in the policy countenanced the stratagem. Most evidently, the use of these simulated papers originated in the best motives. If a person unassured were trading from Gottenburg to Riga, he would have resorted to the same artifice; and he should blame any person who would not take the same care of the interests of the underwriters as of his own.

Lord Ellenborough said, that the sentence of condemnation was stated to proceed on an infraction of the law of nations, in the vessel having those simulated papers on board. If, therefore, the act of the assured, unauthorized by the policy, occasioned the loss, how could the underwriters be rendered liable?

The attorney general contended, that the sentence of condemnation only went to prove, that simulated papers had been carried by the vessel; but the question still remained open as to the propriety of the assured having made use of them. The sentence of the Russian court was not conclusive evidence of the assured having done that which he had no right to do. If the court should be of opinion, that the goods should have been loaded at Gottenburg, then the plaintiff must have a return of premium: and should the propriety of carrying simulated papers be supported, he would then be entitled to damages.

Lord Ellenborough—"You may take a rule to show cause why a verdict should not be given for the *return of premium* on the goods; but, on the other point, my mind is made up. You have argued ingeniously, but falsely. I am not deciding as to the right of carrying simulated papers; but the fact, that what we must suppose a competent court condemned the ship and cargo, on the ground of the law of nations having been infringed by the production of those papers, cannot be denied.—That was the immediate act of the party who introduced them; and this being the case, he cannot call on the underwriters to shield him from the consequences of his own conduct."

Russian warfare.—In the King's Bench, June 17, 1811; the case of *Minett* v. *Bonham* was an action on a policy of assurance on the ship *Elizabeth* and cargo, at and from London and St. Petersburg, or any part of the Baltic. It was tried at the last sittings before Lord Ellenborough, and a verdict given for the plaintiff.

Mr. Topping, on the part of the defendant, applied for a rule to show cause why the verdict should not be set aside, and a

new trial granted. He moved it on two points that were received by the learned lord at the trial. The circumstances of the case were, that the *Elizabeth* sailed under a license granted to Messrs. Pedder, Boghman, and Sidon, and such others, with a cargo consigned to Mr. Frederick Guyger, a merchant residing at Petersburg. The vessel arrived safe at her destination, but on entering the port of Cronstadt, she was seized by the custom-house officers, and military force put on board; and, finally, the cargo was confiscated. The first point on which the learned counsel moved, was, that Mr. Guyger was not a person protected by the license, which was addressed to Messrs. Pedder and Co. and such others. They were British merchants; and the words "such others," could only apply to British merchants; whereas Mr. Guyger was a Russian subject, domiciliated at St. Petersburg, and an alien enemy. Secondly, that the sending on board the revenue officers and the military was an act of the Russian state; and contended, that every subject must be considered as a party to the acts of that state under which they lived. In which case Mr. Guyger was a party to the confiscation of the cargo, and could not seek redress for a loss sustained by his own act.

Lord Ellenborough observed, that with respect to the first point, the court did not think themselves authorized to grant the rule, for the very intent of licenses were to obtain an entrance for British commodities into an enemy's country. The license must be considered as acting completely to protect the person to whom the cargo was consigned, although the person was domiciliated in a country hostile to this. Upon the second point he was not prepared to say that every act of a custom-house officer, or of a military force, that every person in the country ought to be considered as taking a part. On this point the learned counsel might take his rule.—Rule *nisi* granted.

Russian warfare.—Case of *Rucker* v. *Ansley*, King's Bench, London, October 30, 1811. This was an action upon a policy of assurance, upon the Russian ship Fortuna, from London to Riga, and was one of the many Baltic risks which have lately occasioned so much argument in this court; and several of which, on account of the doubts existing upon some legal points, yet lay over for the opinion of the judges.

The substance of Mr. Serjeant Best's argument for the underwriters was, that we were at present at war with Russia, and, as the place of destination was in that country, the policy in this case was not valid. It was necessary to prove that Riga was in Russia, and that Russia was at war with us.

The Attorney General, for the plaintiffs, admitted the first of those points, but contended against the latter.

Captain Lemon deposed, that he sailed from this country in

the said vessel, on the 6th of July, 1808, and was captured in Russia; that he had no means of knowing whether Russia was at war with this country, but when he was there they were talking of war: he heard that some British ships were then captured in the Russian ports, but did not see any of them so captured. The goods remained on board his ship, but the hatches were sealed down. He never got the goods back, as they were taken by custom-house officers.

Mr. Serjeant Best argued, that whatever difficulty there might be in proving that Russia was at at war with England, it was quite impossible but that every one of the jury knew it of their own knowledge. He himself could be a witness that the two countries were actually engaged in hostilities. Several years ago Sir Charles Cotton had captured, and sent to this country, some Russian men of war; and that surely was a state of hostility which still continued, and would do so till it was positively determined by peace; and it was the duty of the plaintiff to show that that hostility was actually terminated.

Lord Ellenborough observed, that the proof that must be adduced upon this subject must be such as could be given upon oath.

Mr. Parke, for the defendant, then proposed to adduce Mr. Richard Thornton; but he not appearing, was called upon his subpœna.

Mr. Binning, a gentleman who happened to be in court, although not subpœnaed, volunteered (after a suitable apology) to give his evidence upon this point, as he was a Russia merchant. He stated, that he had a brother in Russia, with whom he was connected in business, and that in the year 1807, he had a property confiscated by the Russian government, and had never recovered a farthing of the amount of it. This was when the last embargo was imposed. He believed, that, by courtesy, Russian ships had been since permitted to an entry in British ports, but no British ships have been allowed to enter Russian ports without being confiscated. His goods were confiscated when they were coming from Russia to England, and it was done by order of the Russian government; this he knew from correspondence with his brother, and also that British goods were not permitted at all to be imported into Russia, except under certain regulations. He, however, believed, that even the French would permit goods to be imported from this country under certain regulations.

Mr. Layer, another witness called for the defendant, examined by Mr. Serjeant Best, stated, that he was at Russia about a year and a half ago for the space of three months, as a Russia merchant, but was not in that line of business that led him to know that any English ships were taken, condemned, or de-

tained, but he had read of such matters in the newspapers. He had, when in this country, received a cargo from Russia, in a vessel under Russian colours.

The Attorney General, for the plaintiff, argued, that the proof that had been adduced showed directly the contrary of what the defendant wished to make out. That evidence showed that this country was not in a state of warfare with Russia, although he should not deny that Russia was in that feverish state, that it was unsafe for us to send goods there, or for her to export them here. In the present instance, however, it was not enough that Russia was hostily disposed towards Great Britain; but it must be also shown that Great Britain was hostily disposed towards Russia. Russia, confiscating our goods, would not render the confiscation of her goods by us lawful in this country. If we were to consider ourselves in a state of hostility with Russia, it would have been the first duty of our government to have granted letters of marque to annoy that state. If government did not think proper to do so, it was evident that they did not consider the two countries in a state of hostility.—It had, no doubt, been proved, that the Russian government had conficated British property in her ports, but what the secret motives of those acts were, it was not for them (the court and jury) to tell. They knew that in many countries the fiscal and custom-house regulations have required the confiscation of British goods, when these regulations were enforced by the overpowering violence and influence of France. Much British property had, by French usurpation, been sequestrated. The state of the commerce of the world was such at the present moment that it was quite impossible, from the fact of a cargo of British property being seized in any foreign port, to ascertain whether such seizure arose from fiscal regulations, or from a national policy of being at war with us. It was not enough that Russia should declare herself hostile to this, if this country have not declared itself hostile to her. How many countries were under the necessity of declaring themselves hostile to Great Britain, merely through the oppressive power of French troops, and who do, in fact, seize every cargo that is British, and yet we do not consider them as hostile to us. We spared these countries in which we knew they were acts of compulsion, which were to be ascribed to the controlling power of France. Any vessel belonging to these countries, seized by a British cruiser, would not be condemned, as we should believe their conduct to be the act of a great enemy pressing upon them, and therefore we should consider her as neutral. As to Russia, there were no other acts of hostility on her part than that of her confiscating goods belonging to British subjects, and there was no act of hostility of this country towards her. Mr. Binning had told them that he knew of Russian

vessels having been admitted here; and the last witness, Mr. Layer, had stated, that goods arrived in this country in a Russian vessel. It had been proved, in a cross examination, that Russian ships were received into our ports, and he should say that we were glad to see them amongst us. Such being the case then, we could not consider Russia as in a state of hostility towards us; and where was the illegality of our underwriters assuring property to be taken to Russia? There was no need even of a license, except through the orders in council; and in many cases, where licenses were not wanted, they were taken merely to prevent detention by cruisers. Under all the circumstances of the case, there had been no evidence adduced that could warrant the conclusion that the underwriters ought not to be liable under this policy of assurance.

The license was then put in and read. It was dated the 6th July, 1808, and signed by the right Hon. R. Ryder, and granted to P. D. Smith and Co. at Riga, on behalf of themselves and other British and Russian merchants, to trade by the Russian ship Fortuna, bearing any flag, except the French, with a cargo of wine, brandy, cotton, and wool, salt, British and colonial produce, East India goods, and all other goods, excepting hemp, from London, to any port in Sweden or the Baltic, not under blockade, and to import from thence such goods as were not prohibited. This license was to be in force till the 29th of September, 1810; and if the goods were to be imported into Ireland, the vessel was to go north about; but if to any port in England, to touch at Dundee or Leith for a fresh clearance.

Lord Ellenborough, in the course of his address to the jury, observed, that no assurance was legal that was effected upon a vessel bound to an enemy's country, or any country at war with Great Britain. The license, in such case, would be immaterial, as it would be a superabundant document. Upon occasions of this sort, the court were generally furnished with clear and positive evidence, as to whether the country was at war or peace with that to which the vessel was destined. Such evidence, however, was not laid before them upon this occasion; and, therefore, the jury were to declare, from the acts of the Russian government and this country, whether they were in a state of hostility or not; and then the question for them to consider was, whether Smith and Co. of Riga, were to be considered as neutral merchants? The license had made the selection of merchants authorized so to trade. British merchants they certainly were not, but Russian merchants, the subjects of the Emperor Alexander. If that country were one in which no British commerce was permitted to be taken, he could not go the length of the Attorney General, in thinking that there was a neutrality on both sides. Our fiscal regulations might condemn cargoes,

although not as hostile cargoes; but the question in this case depended upon whether that country, in which these merchants resided, was in a state of hostility with this country or not? Upon that point he might observe, that an embargo need not necessarily be an act of hostility, as it might be enforced merely for the purpose of preventing intelligence escaping abroad, as to an expedition sailing from thence. Now it appeared from the evidence adduced, that there was a total prohibition of the importation of British goods into Russia, in English ships; and although Russian ships were received here, he was of opinion, that if one country puts itself into such a hostile disposition as to confiscate our property, the merchants could not be considered as neutral at the time the license was granted.

The jury returned a verdict for the plaintiff.—Damages 300*l.*

However, on the 8th of November, following, Mr. Sergeant Best, moved for a rule to show cause why the verdict, in this case should not be set aside, and a new trial granted. It was contended, on the trial, by the Attorney General, that this country was not at war with Russia; but he (Mr. Sergeant Best) held in his hand the Gazette of the 18th of December 1807, containing his *Majesty's Proclamation declaring the war.*

Lord Ellenborough.—"We are not at war with all the nations which have given us cause of complaint against them."

Mr. Sergeant Best.—"My Lord, I must contend, that his Majesty has a right to declare war or make peace."

Lord Ellenborough.—"Brother Best, we are not disputing the right; but in the absence of all proof, the court and jury could not have acted otherwise than they did; *if you had produced the Gazette*, containing the proclamation, it would have been evidence. It is intolerable, that the Proclamation and Orders in Council are not formed into a book and bound; it is not to be supposed, that we can keep every Gazette.* You may take your rule.

Recovery of premium.—*Goldsmid* and *Eliason* v. *Jansten*: King's Bench, Oct. 31, 1811. This was an action to recover the sum of 116*l.* 19*s.* 2*d.* being the amount of certain premiums of assurance advanced by the plaintiffs on the defendant's behalf. The plaintiffs, who are merchants in London, it appeared, had a consignment of isinglass, amounting to 2,500*l.* sent them by the defendant, a merchant, in St. Petersburg, per the ship

* Considering the proclamations and orders in council as an *essential portion of the laws of England*, they have heretofore been given collectively in several editions of the present work, as nearly to the date of its publication as the process of printing &c. would admit. The expression of the Lord Chief Justice of England has excited more than ordinary notice. *Mr. Garrow*, it is reported, *did not know of the Gazette* containing the order for reprisals, and Lord Ellenborough is stated to have said, "How am I bound to know of all proclamations. It is quite enough to get all the acts of parliament into one's head. It was, therefore, that the question was suffered to go to a jury."

Lax, which, by a letter dated May 11, 1810, they were desired to assure; and, upon its arrival, to lose no time in disposing of it.—This cargo had originally been intended to be consigned to a Mr. Strothers, of Leeds; but, on account of the defendant fearing that some acceptances that were due to him in this country would not be regularly taken up, he thought proper to alter the destination of it. Having subsequently got matters arranged to his satisfaction in that quarter where he had dreaded disappointment, the defendant, by an agent of the name of Barnes, wrote another letter to the plaintiffs, which arrived on the 29th of June, countermanding his former order, and desiring them to transfer the goods to Mr. Strothers, as originally intended. This they accordingly did, by paying that gentleman the proceeds of the cargo which they had sold, but did not deduct the expense of assurance which they had previously effected on behalf of Mr. Jansten.

The defence set up against this claim was, that the plaintiffs should have deducted these expenses out of the original amount of the goods so transferred, and that therefore they must now look to Strothers and not to Mr. Jansten for the reimbursement.

Lord Ellenborough thought that the plaintiffs, Messrs. Goldsmid and Co. had behaved most honourably and accurately towards the defendant and Mr. Strothers, for had they not acted with perhaps too much delicacy, they might have deducted these premiums from the sum they paid over to the latter, on account of the former of these gentlemen. Their not having done so, did not, however, preclude them from recovering the sum from the defendant, on whose behalf they had effected the assurance, as they had paid the premiums previous to the arrival of the vessel, or the countermand as to the delivery of the cargo.

The jury seemed to entertain some doubt as to whether the assurance had been effected on behalf of the defendant or Mr. Strothers, the original intended consignee of the cargo; and being furnished with the various letters which had passed between the parties, they retired, and, in about half an hour, returned their verdict in favour of the plaintiffs.—Damages 116*l.* 19*s.* 2*d.*

Smuggling.—In the Court of King's Bench, Nov. 5, 1811, the case of *Hobbes* v. *Kennan*, was an action against the defendant on a policy of assurance on the ship Jane, from a port of Brasil to Rio Janeiro, or any port or ports in the Rio de la Plata, and return to any port in Great Britain or Ireland. The ship sailed first to the port of Rio Janeiro. She was consigned to Mr. Peter Kendle; and the captain had received directions from the owners to obey the instructions of the consignee. On his arrival there he did not meet Mr. Kendle, but was directed by Mr. M'Farlane, his partner, to proceed to Buenos Ayres. On

the captain's arrival there he found Kendle, who sent a cargo of hides, &c. on board. This was at the time of the established government of the mother country; but just as the viceroy was deposed, and the junta established, when the ship was ready for sea, a number of Spanish soldiers were put on board, and she was detained on account of carrying smuggled goods.

On the cross examination of Captain Browne by Mr. Garrow, it appeared that Kendle had conveyed a quantity of goods on board, without his (the captain's) knowledge, and without paying the duties.

Lord Ellenborough held, that the plaintiff was the cause of his own loss by his agent. He might support an action against Kendle, but not against the present defendant. His lordship, therefore, ordered the plaintiff to be called.—He was accordingly nonsuited.

Abandonment. The case of *Mellish* v. *M. P. Andrews*, in the King's Bench, November 5, 1811, was an action on two policies of assurance on the ship Minerva, from London to the Baltic, with liberty to take in a cargo at any port in the Baltic. On condition she joined convoy she was warranted from capture. There was a second policy of assurance, giving the ship liberty to go from one port to another in the Baltic. The ship proceeded to Gottenburg, and thence to Carlsham for orders, and thence to Schwinemunde, where she remained at anchor three days. The captain went on shore, and on the 3d of May returned on board, as the ship was ordered to leave the port on account of French troops having entered the town; and, being apprehensive of being captured, the captain had the anchor weighed, and set sail to return to Carlsham, but was overtaken by a heavy gale of wind, which damaged the ship's rudder, and broke her windlass; while refitting, she was seized by a number of Prussian soldiers. The captain on the 17th of December, wrote a letter to his owners, stating her capture, and on the 8th of January, 1811, they gave the defendant, the underwriter, notice of their abandonment.

Mr. Park, for the defendant, contended, that the notice of abandonment was given at too late a period, and that the first policy did not give the liberty of going from port to port.

Lord Ellenborough was of the same opinion, and the jury returned a verdict for the defendant.

Simulated papers. In the case of *Oswall* v. *Vigne*, King's Bench, November 7, 1811, Mr. Richardson moved for a rule to show cause, why the verdict in this case should not be set aside. It was an action on a policy of assurance, tried at Guildhall during the last sittings, and a verdict was given for the plaintiff. The learned counsel contended that the verdict should be set aside, on the grounds that the condemnation of the ves-

sel originated in having simulated papers on board, contrary to the tenor of her license granted by the British Government.

Lord Ellenborough—" Having such papers on board, was the act of the party complaining, and the loss has arisen out of his own act; my opinion on the trial was, that the plaintiff had not a right to recover, but the jury thought otherwise.—Take your rule nisi."

SIMULATED PAPERS. In the Court of Common Pleas, November 7, 1811, in the case of *Fiese* v. *Parkinson*, Mr. Sergeant Shepherd moved for a rule to show cause why the nonsuit in this case should not be set aside, and a new trial granted, on an affidavit of surprise. The action was brought at the last sittings at Guildhall, on a policy of assurance on ship and goods. The voyage was from Hamburg, or any port or place in the Elbe, to London, performed under a license, and with simulated papers. This was necessary, as the vessel was coming from Hamburg. It was also proper that the owner of the property should seem to be a resident in Hamburg or some of the neighbouring ports. A person of the name of Claas Hightman was, therefore specified in the papers, although the interest was, in fact, in one Simon Diede. The ship and cargo were lost by capture, and an action being instituted by the assured, the captain of the vessel, who was a foreigner, was called to prove the interest and loss. The captain deposed that the interest was in Claas Hightman, who was only named in the simulated papers for the purpose he had just mentioned. The interest was in Simon Diede; and Hightman was colourably mentioned, as a person residing at Hamburg. The plaintiff, by this conduct of the captain, had been completely taken by surprise. Had he been aware that he would have given such evidence, he could have procured witnesses to put the business in its true point of view.—[Serjeant Shepherd here read two affidavits, substantiating his statement. From these it appeared that the assurance was for 3000*l*. and that Hightman was the mere colourable owner, the interest being really in Simon Diede. The vessel had cleared out for a port in Norway, with simulated papers; she was captured in October, 1810, and condemned in Holland.] Claas Hightman had arrived in this country, in August, 1810, but he had never had any interest in the property. Actions being brought against the underwriters, the captain of the ship had been called to prove the ownership of Simon Diede, as stated in one of the counts of the declaration; but he adhered to the person mentioned in the simulated papers, and the plaintiff was of course nonsuited. The statement of the captain, he (Serjeant Shepherd) did not think arose from his not knowing who was the real owner; but, being a foreigner, and having undergone much danger in Holland, where he narrowly escap-

ed imprisonment, he thought he had better stick to the simulated papers in this country, as he had done abroad.

Lord Chief Justice Mansfield—"You may take the rule, paying the costs. But, if the other side conceive the circumstances to have originated in mistake, let us hear no more about it; let the verdict be set aside."

Peril of the sea.—In the case of *Smith, &c.* v. *Scott*, Common Pleas, Nov. 9, 1811, Mr. Serjeant Shepherd moved for a rule to show cause why the verdict for the plaintiffs in this case should not be set aside, and a nonsuit entered, or a new trial granted. It was an action on a policy of assurance on the ship Helena, from her port or ports of lading, in the Bay of Honduras, to her port of discharge, which was London.—The vessel had sailed from the port of Belise, in the Bay of Honduras, in perfect condition, and, shortly after, was run foul of by a ship called the Margaret. She was so much damaged, as to be obliged to return, and a total loss ensued. The question was, whether that loss had been occasioned by the "perils of the sea?" From the evidence on the trial it appeared, that the gross negligence of the persons on board the Margaret had caused the accident: for, if they had bore away, it could not have happened; and, when some of the Helena's crew went aboard the Margaret, after she had run against the Helena, they found but one man on deck, and he was asleep. Under these circumstances, the learned Serjeant contended, that it was not a loss which the owners of the ship were protected from. The proper course would have been to have brought their action against the owners of the Margaret. The accident could not be considered as occasioned by the perils of the sea, for there was no operations of the winds and waves against the Helena: the misfortune was entirely attributable to the culpable conduct of those on board the other vessel.

Lord Chief Justice Mansfield observed, that although the conduct of the Helena's crew was blameable, still he could not consider the accident as any other than a peril of the sea; for, most assuredly, the wind and waves forced one vessel against the other. If the case were so flagrant, the underwriters might bring their action against the owners of the Margaret, and the Helena's people might be compelled to give their evidence. But, if the learned Serjeant's doctrine were allowed, it would give rise to questions without end. In every case, when a vessel was lost by being run foul of, it would be necessary to enter into an inquiry, whether she had been properly managed.

Mr. Justice Heath observed, it would go much further. If a vessel were lost upon a rock, it might be contended that it was not a peril of the sea, because the master was unskilful. Rule refused.

ILLEGAL EXPORTS.—In the case of *Gray* v. *Lloyd*, Common Pleas, Nov. 13, 1811, Mr. Serjeant Shepherd showed cause against a rule *nisi*, obtained by Mr. Serjeant Lens for the underwriters, why a nonsuit should not be granted. It was a policy of assurance on a ship called the Alexander, from the Cape of Good Hope to the Isle of France, or any other island in the East Indies, in the possession of this country. The governor of the Cape, Lord Caledon, granted a license for all the cargo, except some knives and forks, and twelve military saddles. The agent of the East India Company also granted his license. The objection taken by his learned brother on the trial was, that it was unlawful to export British goods from the Cape to any port eastward of it; and if it was legal, the knives and forks, and the saddles, not being mentioned in the license, must prove fatal to the action. The jury, however, thought otherwise, and gave a verdict for the plaintiff. It was a voyage most meritoriously undertaken, as the cargo was intended for the British force investing the Isle of Bourbon. It was true that the statute of Charles II. said it was unlawful to import or export goods from one colony to another, and that they must be shipped from England, Wales, or Berwick-upon-Tweed, direct. He allowed this was a prohibition, but his answer to it was, that it had been repealed by a statute of the 46th of George III. chap. 3, which authorized his Majesty to make regulations for the trade of the Cape of Good Hope; that act expired, but it was followed by two others of the 47th and 48th of the King, but the question, he contended, did not rest on those statutes, but having the authority of an order in council, authorizing his clients to do the act they did; but on the trial the order in council of the 46th of the King was produced, instead of the 48th.

Lord Chief Justice Mansfield—"The orders in council ought to be printed and bound in a book; as they are now, it causes confusion every day. I wish you, brothers at the bar, would take it into your consideration, and suggest some mode that it might be accomplished by."

Mr. Serjeant Shepherd—"If your lordship was to give an intimation to the council office, it might have some effect; but I am afraid they would not attend to us."

Lord Chief Justice Mansfield—"They would surely give you copies of them."

Mr. Serjeant Best—"They certainly would, my lord, but they would make us pay an intolerable price for them."

Mr. Serjeant Shepherd, in continuation of his argument, stated, that the order in council said, that it should be lawful for the subject of any foreign nation, in amity with his majesty, to enter into the ports of the Cape, and import and export all wares and merchandise, except those imported from England,

Ireland, &c. on paying 15 per cent. duty, but that a less duty should be laid on English bottoms. The next clause was, that no goods should be sent eastward of the Cape unless they were carried in the ships of the East India company. He contended it was saying, that you might import from all the other territories of his Majesty, but you could not export from the Cape, except in the East India company's vessels, or by their license. The navigation acts were not contrary to the order in council. It was well known that the expeditions which were fitted out in India, were supplied from the Cape of Good Hope, and the ship in question had a license from the company to carry the provisions. His brother (Lens) would contend, that the order in council was only for the states in amity with his Majesty, but not for British subjects. He, (Serjeant Shepherd) would contend, that it never was the intention of the order, that it went to regulate the duty of British ships, and gave them the preference. It was preposterous to think that any order in council could have it in its contemplation to give a preference to foreign subjects, to the disadvantage of British subjects. Under these considerations, he trusted the court would discharge the rule.

Mr. Serjeant Best followed on the same side.

Mr. Serjeant Lens, on the other side, contended, that the verdict could not stand, as the orders in council could not interfere with the navigation acts, that one must be drawn to agree with the other. The statute of Charles II., and of William the Third, completely prohibited the sailing of any British vessel eastward of the Cape, except the ships of the East India Company.

Lord Chief Justice Mansfield—"You need not go any further, brother Lens. We have read, over and over, the orders in council, and have considered this objection of the underwriters. The question is simple, and we must decide it, as we do all others, according to law. It is, whether British goods can be exported from the Cape to the eastward of it, or only from England. By the acts of the 2d, 12th, and 15th of Charles II., we all know it is not lawful. The orders in council do not affect the trade direct to the Cape. It is not natural that British ships should be excluded, when foreign ships, in amity, were allowed to import and export; and it was not necessary to give them a right they had before. The law was, that the goods must come from Great Britain, and not coming from thence, it was unlawful; therefore, let the rule be confirmed. How did you shape your rule, brother Lens?"

Mr. Serjeant Lens: "For a nonsuit, my lord."

Mr. Serjeant Shepherd said, he was aware that he was not regular, but hoped he would be excused. He wished, instead of a nonsuit, that a special verdict might be taken.

Mr. Serjeant Lens objected to a special verdict. He said, in fact, he had no power, as his client was not in court.

Lord Chief Justice Mansfield—"I would recommend it to you, brother Lens, as a special verdict will sooner decide the cause than a new trial."

Mr. Serjeant Lens—"I would pay every deference to your lordship's recommendation if I had any discretion in the case, but I have not." Rule confirmed.

Loss, total or partial.—In the Court of King's Bench, Nov. 15, 1811, the case of *Robertson and others* v. *Hammell*, was an action of assumpsit, brought by the plaintiffs on a policy of assurance on the ship Atlantic, from Corunna to London, bearing date the 13th January, 1809. The cause was tried before Lord Ellenborough, at Guildhall, last Trinity Term, when a verdict was given for the plaintiffs, subject to the opinion of the court on a case drawn up for their decision: The circumstances were these. The ship Atlantic, the property of Messrs. Fisher, Kidd, and Waring, and the ship Ross, belonging to the plaintiffs, had sailed in company from Jamaica. They were taken on their voyage by a Spanish privateer, and carried into Corunna. Application was made for the restoration of the property, but it was refused, on the ground that the ships had been captured at a time when hostilities between Spain and England had not ceased. Fisher, Kidd, and Waring abandoned the Atlantic, and the underwriters (among whom was the present defendant) paid as for a total loss. Subsequently, however, all the parties interested in the vessels and cargoes joined in a power of attorney, which was transmitted to their agent, a Mr. Cowen, at Corunna, empowering him to use every means he thought proper to procure restitution of the property captured, or any part of it, and directing him to forward to England such part as he might procure to be given up, for the benefit of those interested. He was successful in his exertions, and effected the restoration of some of the property. In writing home to the plaintiff, Mr. Cowen stated, that the "property had been thrown into a *masse*, and, to simplify the business, he consigned the ship Atlantic to him, and advised him to effect an assurance on her." He, at the same time, drew bills on the plaintiff for his expenses, which were accepted. According to Mr. Cowen's advice, the vessel was assured; and Mr. Hammell underwrote the new policy. But, before she got out of the harbour of Corunna, the French gained possession of the town, and the Atlantic was seized.

Mr. Taddy, for the plaintiff, stated that the questions for their lordship's decision, as detailed in the case, were, whether the plaintiffs were entitled to recover for a total or partial loss, or for a return of premium. This entirely depended on the in-

terest they had in the vessel. 1st. Whether they had an assurable interest? 2dly. To what extent their interest proceeded; whether it was greater than the amount of the bills they had accepted for the expenses of Cowen? And, 3dly, Having no interest of their own, whether they had a right to sue on that of the registered owners, Fisher and Co.? He would not take up much of their lordships' time on the first of these points, as he conceived the question of their having an assurable interest was supported by the decision of the House of Lords, in the case of *Lucina* v. *Crawford.*

Lord Ellenborough—"Can there be any doubt that they have an interest, independent of the sums paid to Cowen, when it is recollected that the property was to be sold in a *lump*, for the benefit of all the parties interested. The ship and cargo were thrown into *hotch-potch.*"

Mr. Taddy then stated, that the plaintiffs stood in a variety of characters, in each of which they had an assurable interest. In the first place, they were consignees of a person who had a power to sell the property in Corunna; and, of course, had an assurable interest. Next, they had accepted bills for the outfit of the vessel, and for the expenses of Cowen, which gave them an additional interest; as, if the vessel were in their possession, they would have a lien on it to that amount: and, being in the possession of their agent, it was legally in their own hands. And he contended that Mr. Cowen, having been empowered by all the parties interested, had a right to make the consignment. If the ship had arrived, the plaintiffs would have been trustees for the registered owners, Messrs. Fisher and Co., who having been paid for a total loss, had no beneficial interest in the property, though they had a legal one: their interest, of course, was absorbed by the underwriters, of whom the defendant was one, and for whom, consequently, the plaintiffs would have been trustees. Cowen having been authorized by all the parties to act for their benefit, had directed the plaintiffs to assure; and they were justified in doing so. It was evident they had an assurable interest, and were entitled to recover for an entire loss, subject to such claims as the other parties interested might make.

Mr. Richardson, for the defendant, contended, that the plaintiffs, in the first place, had no assurable interest; and, secondly, if they had, it did not exceed the expenses incurred by Cowen, which they had paid. Fisher and Co. could not be supposed to have any interest in the ship and cargo, as they had received the total loss, and according to the judgment of the court of Admiralty, their interest was divested by the hostile capture, and the subsequent restitution. They, therefore, could not impart to others that which they did not possess themselves. He de-

nied, that a mere consignor, without general property in the thing consigned, could give an assurable interest to a consignee, farther than the extent of any advances he might have made. There was a material difference between the consignment of a ship and cargo, unless the former were sent for the purpose of being sold, which did not appear in the present case. Mr. Cowen had thrown the property into *hotch-potch;* but, even in that case, it could not be contended that the expenses of the ship Ross, which belonged to the plaintiffs, had any thing to do with the Atlantic, which had been the property of Messrs. Fisher and Co. They could not, therefore, recover on that ground, nor could they on any interest derived from sums which they had given to Mr. Cowen. Those sums were in the nature of salvage, and the person who effected that salvage could not transfer his right to another.—He must himself sue. The plaintiffs, he maintained, could not prove a lien on the ship, as it was not in their possession, when the assurance was effected. And the law of England, he believed, would not allow a lien in such a case, unless by special agreement.

Lord Ellenborough—"Cowen, who was their agent, had possession."

Mr. Richardson then stated, that, if it were not for the register laws, the case might be argued as if the whole interest were in the underwriters, they having paid the total loss, and thereby acquired an interest in the property, similar to that obtained by the purchase of goods. In conclusion, he observed, that the plaintiffs could have no assurable interest farther than their share of the ship and cargo in *hotch-potch*, and the amount of the bills drawn on them by Cowen.

Lord Ellenborough said, that the plaintiffs had a right to recover for a total loss, subject to such claims as persons interested might hereafter make on the property. The agent abroad, Mr. Cowen, was authorized to direct the assurance of the vessel, armed as he was with full powers from both parties to use his utmost endeavours to preserve the property; and the plaintiffs certainly had an assurable interest; 1st. By the part of the property thrown into *hotch-potch* which must belong to them; 2dly, In respect to the bills which had been drawn on them by Cowen; and, 3dly, With relation to the defendant himself, to whom, ultimately, the plaintiffs must account for a certain proportion of the property.

WARRANTY.—In the Court of King's Bench, Jan. 13, 1812, the case of *Cozennus* v. *Blackburne*, was an action on a policy of assurance, effected on goods shipped on board the Vrow Alida, from London to any port or ports in the Baltic, with a warranty against capture in her port of destination.

The vessel, it appeared, arrived at Schwinemunde, on the 1st

of November, where she remained till the 12th. Mr. Bolgar, the agent there, in consequence of no opportunity appearing to dispose of the cargo, directed the vessel to proceed to Carlsham.

She accordingly sailed for that port; but was driven back to Schwinemunde, by contrary winds, on the 16th of November, where she was taken possession of by a military force.

The Attorney General, for the defendant, contended, that the port of Schwinemunde having been the original port of destination of the vessel, and she having been captured there, the underwriters were exonerated from the loss, by the warrant contained in the policy.

Lord Ellenborough held, that the port of destination was variable; although the vessel might have originally sailed for one port, yet it was in the power of the agent to change that destination, and send her to another. If the jury gave credit to the statement of Mr. Bolgar, that he had sent the ship to Carlsham, then that became her port of destination; and Schwinemunde, where she was seized, and into which she had been driven by contrary winds, ceased to be so, in which case the plaintiff had a right to recover. Verdict for plaintiff, damages, 300*l.*

FRAUD IN POLICY.—In the King's Bench, Guildhall, London, Jan. 21, 1812, *Denhison* v. *Buck.* This was an action upon a policy of assurance, on the Portuguese brig Felice, from Marinham to Liverpool, on 330 bags of cotton, valued at 3,300*l.*, and lost on the Saltees Rock, on the coast of Ireland.

The defence was, that there was a fraudulent concealment at the time of effecting the policy. It appeared that the persons originally interested were the Messrs. Dickensons, who becoming bankrupts, the management of their affairs was entrusted to three persons of the names of Ransam, Bird, and Eden, who, on the 24th of January 1812, wrote to their agent (the plaintiff,) directing him to effect an assurance on ship and cargo, stating, that they understood from a "gentleman" who left Marinham on the 12th of November, in the ship Recovery, that the Felice would sail on or about the 27th. Upon which information the policy was underwritten. It appeared, however, that the Felice sailed the same day with the Recovery, and that on the 17th of January, seven days before this letter was written, the ship was lost.

Mr. Parke, for the plaintiffs, in answer to this, called Mr. Hodgson, their agent at Marinham, and who gave them the information stated in the letter of the 24th January, from whose evidence it appeared, that he had stated on his return, to Eden and the others, that, at the time he sailed, the Felice was lying in the harbour with her cargo on board, ready to sail, and only waited for her papers from the custom-house. It also appeared, that in a former letter written by the witness, previous to his

return, he had informed Eden and the others that he expected both the Recovery and Felice would sail on the 12th, and to take this as their guide in effecting the assurance, and that the Recovery was then underwritten, but the Felice was not.

The Solicitor General, for the defendant, contended, that there was a concealment, inasmuch as Eden, when he wrote directing the assurance, had not informed the underwriters of the real cause which detained the Felice, namely, that she was waiting for her papers; and also had described the person giving him his information as a "gentleman," while in all their other transactions he had given him his name, and described him as their agent; that the vessel was lost on the 17th, and Hodgson arrived on the 18th, and thus a week was suffered to elapse, from the 18th to the 24th. This carried with it a strong suspicion of an intention to misrepresent and defraud the underwriters.

Mr. Eden was then called, and stated, that the cause of the delay arose from his not being able to procure the papers and the necessary information from Hodgson, until the 24th: because previous to that time they had not paid him his commission, and he would not resign the papers until his claims were satisfied.

Lord Ellenborough—"Then you promised to pay him his commission and charges, if he would make you out a case fit for assurance. I should have thought such a representation as was made in that letter, and the informations to the defendant to underwrite, was such as would have effected the policy, even if there had been no intention of fraud; but now the case smells very rank, and the further you go the worse it will be. The information which you had, bad as it was, you ought to have communicated to the underwriter. You ought to have said, 'Our agent has informed us, that the Felice is lying in the harour ready to sail, but is detained from want of her papers,' and not to have assumed it as a positive fact that she would be detained from the 12th to the 27th; on that account it was certainly a false and fraudulent representation."

The plaintiff was accordingly nonsuited.

Stamp duty.—In a case *Rapp* v. *Allnutt*, which was an action on a policy of assurance for 9,500*l.*—the interest of which appeared to be in different persons, the respective shares of several of whom, comprised the fractional part of 100*l.* A verdict had been given for the plaintiff.

Mr. Scarlett, at the time of the trial, contended, on the part of the defendant, that the policy was void, inasmuch as the stamp had been taken out for an integral sum, namely, 9,500*l.*; whereas, by the provisions of the Stamp Act, there should have been an addition to the stamp, for every fractional part of 100*l.*

as if it were the whole sum. The learned gentleman this day moved for a conditional rule to show cause why the verdict should not be set aside, and a new trial granted on the same grounds that he had before advanced.

Lord Ellenborough expressed his opinion strongly, against the principle sought to be established, as his lordship had done on the trial. At the time the assurance was effected, the interest existed in the party acting for the assured, as their trustee, and, as the policy was to be valued at a future time, it was not possible for him accurately to calculate the respective proportions. The legislature, he was convinced, had never contemplated such an interpretation of the act, which would have the effect of destroying the business of assurance altogether.—Rule refused.

Construction of policy. In the Court of Common Pleas, May 11, 1812, *Levi* v. *Vaughan*.—The action was upon a policy of assurance upon a ship bound for Pillau, or any port in the Baltic. There was a warranty in the policy, which protected the underwriters from any confiscation that might take place from forces in the port or ports of discharge. It appeared that the ship proceeded on her voyage, and that, upon arriving off Pillau, she was taken by an armed force sent from the shore, and condemned.

Lord Chief Justice Mansfield observed, that he felt great regret he could not relieve the underwriters in this instance. The question for discussion was, whether, as the warranty had protected the underwriters from capture by forces in the specified port, the word "in" might not be legally construed into the word "of"—that was to say, as the ship had been captured by a force coming from the port in question, it might not be considered as a capture within the meaning of the warranty, inasmuch as it appeared that the vessel assured had actually intended to enter the port of Pillau, although she had been captured before she had carried that intention into effect. Upon duly weighing the signification of the word *in*, however, as well as the fact of the capture having been made a mile and a half distant from Pillau Roads, or from any place where vessels usually unloaded, he could not put such a construction upon it as to save the underwriters, although he was convinced the capture which had been made was the very thing against which they wished to guard. As there was a proper mode of phraseology, and as they had not adopted it, they must be subject to the loss. A former verdict for plaintiff was therefore confirmed.

Deviation. In the King's Bench, November 10, 1802, in the case of *Phelps* v. *Clagtet*, Mr. Taddy moved for a rule to show cause why a new trial should not be granted in this case. It was an action on a policy of assurance, on goods on board

the Margaret-and-Anne, bound from Iceland to London, with or without letters of marque. The lading of the vessel commenced on the 8th of July, and finished on the 14th of August; and on that day, the event took place, which enabled the underwriters to oppose the plaintiff's claim.

The Margaret-and-Anne, it appeared, was lying in port, when a vessel appeared in sight. As she carried letters of marque, she immediately went out to see what the strange vessel was, and, if necessary, to capture her. She proved, however, to be an American, and the Margaret-and-Anne returned to port, and sailed in three days after, on her voyage. This leaving the port to pursue a vessel, and subsequently returning to it, was deemed a clear deviation fron the stipulated voyage.

Mr. Taddy contended, that this could not be considered a cruising, as the Margaret-and-Anne had not proceeded in search of that which might or might not be met with; but, seeing a vessel entering the mouth of the harbour, and she being a letter of marque, there was a good cause for proceeding against her. In the case of *Parr* v. *Anderson*, it was the opinion of the court, that the vessel carrying letters of marque might capture another, without incurring the risk of a deviation, if she did not go out of the way. Indeed, when letters of marque were granted, it must be for more than the mere purpose of defence. By them, a vessel was not only permitted to defend herself, but to attack another, if necessary, and liberty to chase was given by them, if the vessel did not proceed out of her way, as was held in the case he had before cited.

Lord Ellenborough—"You did go out of your way; and were in a port; you chased a vessel; and, when you could not capture her, you returned."

Mr. Taddy—"We did not go to look for prizes; but, seeing a strange vessel coming into port, we weighed anchor and went out to her.

Lord Ellenborough—"Why did you go back?"

Mr. Taddy—"Because we had not our papers on board."

Lord Ellenborough—"Then, even if you contend, that this was the commencement of your voyage, you must admit that you began it unprepared, through your greediness of prize."

Mr. Taddy—"We did not mean to commence our voyage."

Mr. Justice Grose—"O! it was an experiment before your voyage."

Mr. Taddy—"We contend, that, under the letters of marque, we were authorized to act as we did."

Lord Ellenborough—"You had no right to do this, at the risk of the underwriters."

Mr. Taddy—"They gave us liberty to carry arms."

Lord Ellenborough—"On the voyage and in the voyage, but

not in pursuit of prize. Besides, I am not clear that this was not a *cruising;* I think you may cruise, even when you have a definite object."

Mr. Taddy—"That is not the general acceptation of the term. It is supposed to mean a going over the sea in search of plunder: So Dr. Johnson has it."

Mr. Justice Grose—"O! your sailing was a mere experiment."

Lord Ellenborough—"Yes, it was an experiment, and the present motion appears to be the same."—Rule refused.

LICENSES.—In the Common Pleas, Nov. 27, 1812, the case of *Morgan* v. *Oswald*, was an action on a policy of assurance, previously tried at *Nisi Prius*. A special verdict had been entered for the plaintiffs under the following circumstances. A British merchant, of the name of Simpfin, had obtained a license from the Board of Trade, to import Russian produce from Archangel. He disposed of that license in the way of trade, and an American vessel was sent with it to Archangel, and there laden on account of Russian merchants. On her homeward voyage the vessel was captured, and a demand made in consequence on the assurers. When it was contended, in demurrer, on their part, that a license, granted to a British merchant, could not cover foreign property; and, under the direction of the judge, a special verdict was found for the plaintiff, subject to the opinion of the court on that point of law.

The judges delivered their opinions *seriatim*, and thought unanimously, that, in the present state of Europe, those licenses were granted, in order to give the means of supplying the country with such foreign produce as it wanted; they found themselves bound, in consequence, to put the most liberal construction on the terms of those licenses, and they accordingly confirmed the verdict for the plaintiff.

DEFECT IN POLICY.—In the case of *Cohen* v. *Hannam*, Court of Common Pleas, July 5, 1813, which was an action upon a policy of assurance, trial at Guildhall, London, and in which a verdict was taken for the plaintiff: The question was, whether the interest in the policy had been properly averred? It appeared that the plaintiff was in partnership with his brother, but effected the policy in his own name only. A total loss having taken place, an action was brought by plaintiff against defendant, the underwriter, to recover the amount. The declaration in the action contained two counts, in which the interest was averred to be in the present defendant and his brother, and the jury found for plaintiff. This verdict, the learned judge remarked, was certainly not good, as in all events

the plaintiff could have only a right to the moiety of the whole loss; but, independent of this, his Lordship observed, that it was incumbent upon an individual effecting a policy, to state all the persons to the underwriter, who had any interests in the goods assured. The reason for this was obvious, for unless such a course were pursued, it would be impossible for the underwriter to know with whom he was forming a contract; and a person interested in the policy might become a witness on the trial against him, or might actually be on the jury. The case of *Bell* v. *Ansell*, tried in the Court of King's Bench, his Lordship thought perfectly analogous to this, and the judgment there given appeared to him perfectly correct. With this impression the court, in the present case, had decided in favour of the defendant, and the plaintiff became *nonsuited.*

Allegiance.—The case of *Bell* v. *Reid*, in the King's Bench, July 6, 1813, arose upon a policy of assurance, on the ship *Imogen*, and was tried before Lord Ellenborough, at Guildhall, when a verdict was returned for the plaintiff, leave being given to move for a new trial, on the following point:—The plaintiff was a natural born subject of this realm, but domiciliated in America. The policy was underwritten on a voyage from America to Great Britain, but in her way, the *Imogen* touched, for orders, at a Swedish port, this country being then at war with Sweden; though, with respect to America, she was a neutral power. The *Imogen* was subsequently taken by the Danes, and the underwriters in England resisted payment, on the ground that the plaintiff, in thus touching at an enemy's port, he being a British born subject, had been guilty of such a deviation from, and breach of, his natural allegiance, as debarred him from recovering on the policy.—It was argued, on the other hand, that plaintiff being a naturalized subject of the United States, and our government allowing the subjects of America to trade with Sweden as neutrals, the plaintiff bearing the character of an American subject, had not been guilty of a deviation from his allegiance, in thus calling for orders to a port belonging to a power at war with us. The court now declared, that, though this important subject might be well worthy the attention of the legislature, yet, considering it as a mere dry question of law, and adverting to the cases bearing on this point, which had already been decided, they were obliged to say, that the thus calling at a hostile port was not a deviation or breach of allegiance; the right so to call being a privilege which the plaintiff possessed in his character of an American subject. Such being their opinion, the rule for a new trial must be discharged, and the verdict for the plaintiff confirmed.

Bay of Biscay.

The following circumstance was related to me by Mr. Alexander Ranken, merchant, of Philadelphia :—Several years ago, a vessel was insured, in general terms, "from Philadelphia to one or more ports in the Bay of Biscay, and back to the United States." This vessel, however, went only to Corunna, and was lost on her homeward bound passage. The underwriters refused payment of the loss, on the ground that Corunna was not considered to be in the Bay of Biscay; that that bay extended only from Ushant to Cape Ortugal. In the Naval Gazetteer, that bay is described as "extending from the island of Ushant to Cape Finisterre," (which includes Corunna).

My object, in noticing this fact, is to call to it the attention of persons shipping to the Bay of Biscay, and to advise that they cause to be defined in the policies of insurance, the limits of this bay, as understood by underwriters.

MISCELLANEOUS SUBJECTS.

Forms in which Accounts are kept on a Voyage.

The Portage Bill of the R. W. on a voyage to Madeira and Isle of Mayo.

Time of Entry.	Men's Names.	Post on board.	Time of discharge.	Time on board.	wag. p. month.	Whole wages.
1815.	W. H.	Master	Sept. 20	4 mo. & 10 days	$50	$216 66
May 10.	G. H.	Mate	do.		32	138 66
	Jno. W.	Seaman	do.		18	78
	S. W.	do.	do.		18	78
	A. B.	do.	do.		18	78
	Jas. C.	do.	do.		18	78
	W. B.	do.	do.		18	78
	Is. W.	do.	do.		18	78
	G. H.	Cook	do.		18	78
					18	
						$901 32

If any men have been discharged during the voyage, it must be entered up to the date of their discharge.

Dr. *John Williams, seaman on board the the ship R. W. with W. H.* Cr.

1815.		D.	C.
May 29	To cash paid for protection at the custom-house		25
June 2	To do. advanced him at Funchal	1	00
" 6	To do. paid Henry Brown, of Funchal, per bill	7	36
" 8	To do. paid discount for dollars, at 10 per cent.		73
" 10	To do. paid Henry Brown, as per bill	2	75
	To two pair shoes	3	20
	To hospital fees		47
	To monthly pay to his wife, paid by the owner	27	
	To one month advance	18	
	To balance paid in full	17	24
		$78	

1815.		D	C.
	By wages from the 10th May to the 20th of September, four months and ten days, at 18 dollars per month	$78	00

Form of a Receipt for Seamen's Wages.

Received of W. H., master of the ship R. W. of Philadelphia, seventy-eight dollars, which is in full for wages, and in satisfaction of all other claims and demands whatsoever on the said master or owners, during the time of my service on board the same ship, or any other ship, belonging to the same owners.

Witness my hand, at Philadelphia, the 25th of September, 1815.

JOHN WILLIAMS.

N. B. For the rest of the crew, the accounts will be similar.

Account of Disbursements against ship R. W. on the voyage from Philadelphia to the Isle of Mayo.

1815.		D.	C.
May 22	To cash paid for a frying pan	1	25
" 23	To do. for my passage in New Castle packet	1	25
	To. do. for three meals in do. do.	1	50
	To do. for the following bought at New Castle, viz: 1 bumkin block,. 50 cents—1 pair of pincers, 37 cents—1 pair of grains, 50 cents---4 dishes, 25 cents,	1	62
July 5	To cash paid Manuel Fyale for 2 days work in Funchal Roads, at $1 per day	2	00
	To do. paid Manuel Viera for 2 days work in Funchal Roads, at $1 per day	2	00
	To do. paid Alexander —— for 6 days work at do., at $1 per day	6	00
	To do. paid Manuel Francisco for 8 days work at do., at $1 per day	8	00
	To do. paid John Lawrence for 6 days work at do., at $1 per day	6	00
	To do. paid Joseph Lorenzo for 6 days work at do., at $1 per day	6	00
	To fresh provisions and vegetables for seamen, Sunday, 25th of June, in Funchal Roads	3	50
	To fresh provisions and vegetables for seamen, Sunday, July 2d, in Funchal Roads	3	50
July 7	To cash paid Manuel Piree for 5 days work at $1 per day	5	00
" 9	To do. paid boat hire at Funchal	2	00
	To do. paid a man for one days work on board	1	00
	To do. paid one man for going for the captain of the visit boat	1	00
	To do. paid four men for assisting to unmoor ship	4	00
	To do. paid two men for mooring ship again	2	00
	To do. paid for two extra visits in consequence of an English ship driving foul of us	5	20
	To do. for one shot from Loo Castle fired at the boat whilst mooring ship again	2	10
" 10	To do. paid four men and boat for assisting to unmoor ship	7	00
	To do. paid for fresh provisions at Mayo	1	67
	To do. paid for 800 nails at 40 cents	3	20
	To do. paid for fresh provisions for seamen	1	70
	To do. paid for bringing off seven casks of water, at 50 cents	3	50
	To do. paid for 250 nails at 40 cents	1	00
		$82	97

Dr. *Mr. J. B. owner of the Ship R. W. in account with W. H.* Cr.

1815.		D.	C.
	To cash paid disbursements per account at New Castle	$ 5	37
	To do. paid do. at Madeira	66	30
	To do. paid do. at Isle of Mayo	11	10
	To do. paid amount invoice of cargo of salt	1280	37
	To do. advanced officers & seamen	204	82
	To wages as master, from May 19, to September 26, following, being 4 months, 6 days, at $50 per mo.	210	00
	To 18 lay-days in Madeira, at $1 per day	18	00
	To 16 do. in Isle of Mayo, at $1 per day	16	00
	To board in Philadelphia from September 10, 1815, to Sept. 26, inclusive, 2 weeks and 1 day, at $5 per week	10	71
	To cash paid for rum for people on board, Sept. 10 and 11, 1815.	3	33
	To cash paid health officer	10	00
	Amount	$1834	92
	Errors excepted	1210	00
	Philadelphia, Sept. 25th, 1815.	$ 624	92

1815.		D.	C.
	By cash received from the consignees at Madeira	$1150	00
	By do. received in advance before sailing	50	00
Sept. 11.	By do. received	10	00
		$1210	00

Invoice of Sundries Shipped by B. K. on board the Schooner Sally of Philadelphia, S. T. Master, bound to St. Ann's (Jamaica) on Account and Risk of the Shippers, and Consigned to said Master, viz:

300	Barrels superfine flour	$7	0	$2100	00		
	Inspection . .		1	3	34		
	Porterage . .		6	18	00		
	Lining . . .		5	15	00	$2136	34
60	Barrels herrings .	5	0	300	00		
	Inspection . .		5	3	00		
	Porterage . .		6	3	60	306	60
40	Barrels mackerel .	7	0	280	00		
	Porterage . .		6	2	40	282	40
36	Barrels corn meal .	4	0	144	00		
	Inspection . .		1		40		
	Porterage . .		6	2	16		
	Lining . . .		5	1	80	148	36
33	Barrels rye meal .	4	0	132	00		
	Inspection . .		1		37		
	Porterage . .		6	1	98		
	Lining . . .		5	1	65	136	00
30	Kegs crackers . .		48	14	40		
	Porterage . .				37	14	77
8	Hhds. codfish 75 quintals . . .	4	50	337	50		
	Hogsheads . .	2	0	16	00		
	Porterage . .		85	2	80	356	30
	Proof of property and bills of lading			1	12		
	Commission $2\frac{1}{2}$ per cent.			84	50	3380	77
						85	66
	Errors excepted April 25, 1808—B. K.					$3466	43

Account of Sales of Sundries Shipped on board the Schooner Friendship, I. H. Master, and sold for Account and Risk of A. B. Merchant, at Philadelphia, viz:

1808.				D.	C.
Jan. 20	Charles Baggs, 20 boxes of candles, weight 671 pounds, at 27 cents			181	20
	Cash 14 baskets oil at 10 dollars			140	00
	Do. 25 boxes brandy fruit at 6 dollars			150	00
	Thomas W. Preston, 10 barrels cod fish 10400 pounds, at 7 dollars			728	00
	Do. 119 barrels pork at 21 dollars			1029	00
	Do. 42 bbls herrings at 6.50			273	00
	Do. 100 boxes soap 2805 lb. at 16 cents			448	80
	Cash 22 kegs butter 931 lb. at 20 cents			186	20
	Do. 44 barrels mackerel at 8.50			382	50
	Charles Smith, 503 pounds flour at 11 dollars			5533	00
				9051	70
	CHARGES.				
	Paid storage,	$ 7	25		
	Paid duties,	428	19		
	Deduction on 3 barrels mackerel,	1	50		
	Weigh-house fees,	30	10		
	Tide waiter,	3	00		
	Porterage,	21	73		
	Cooperage,	3	34		
	Permits,	3	75		
	Brokerage, at 1 per cent.,	90	51		
	Commission an 5 per cent.,	452	56		
				1041	95
	Nett proceed,			8009	95

Errors excepted,

Caracas, February 8th, 1808.

T. C.

Freight List of the Schooner T——, S. B. Master, to the Island of Martinique from Philadelphia, at one dollar and three quarters per Barrel out, viz:

Marks.	Qua.	Packages.	Contents.	By whom Shipped.	Barrels.	Barrels.	Dolls.	Cts.
JJ	24	Casks	Claret,	Jas. Jollings,	72			
	200	Barrels	Flour,	Ditto	200			
	38	Ditto	Porter and Cider,	Ditto	38			
	6	Baskets	Vermicelli,	Ditto	2½			
	31	Boxes	Wine,	Ditto	14			
	4	Crates	Queen's Ware,	Ditto	22			
Bc	6	Barrels	Sausages,	Ditto	6			
TT c	7	Boxes	Larded Meats,	Ditto	3			
JJ	110	"	Soap,	Ditto	30			
	25	"	Candles,	Ditto	7½			
	3	"	Perfumery,	Ditto	5			
						400	700	00
LC SW	30	Bales	Nankeens,	Jn. Latame,	24			
PP	1	Box	Calicoes,	Ditto				
JL	1	Trunk	Women's Shoes,	Ditto	6			
	1	Barrel	Feathers,	Ditto		30	52	50
B	30	Barrels	Flour,	Jer. Booneson,	30			
	240	Bags	Corn,	Ditto	150			
	117	Boxes	Soap,	Ditto	30½			
	3	Barrels	Hams,	Ditto	3			
	20	Hams		Ditto	1½			
						215	376	25
				Errors excepted,			$1158	25

Philadelphia, May 22, 1807.

A. B.

N. B. When freight is taken at the rate per barrel, a flour barrel is measured, and its solid contents found, and all the other packages are measured, and estimated according to this, as is the case in the above list. For the measurement of packages see page 336. In measuring casks in order to ascertain the freight by the ton, &c., the greatest diameter must be taken, you must proceed to measure barrels as other packages—except that one fifth is taken off for the round.

Account of goods taken into the Ship A. B. bound to Hamburg.

Date.	Marks.	Numbers.	Packages.	Length. F. I.	Breadth. F. I	Depth. F. I.	Solid contents. F. I.	Freight.	By whom shipped.	To whom consigned.	Where stowed.
1822. May 2.	FA	1 to 90	90 hhds sugar						F. Goodman.	G. Tripp.	Ground tier
	SA	1 to 150	150 boxes sugar								Second tier

Account of Men on shore at the Isle of Mayo, measuring, filling, carrying, and lowering Salt into the boat, and at work on board, at three quarters of a dollar per day.

Men's Names.	July	M.	T.	W.	T.	F.	S.
Antonio Duarta	31	1	0	1	1	1	½
Theodosia Rosa		1	0	1	1	1	½
Seraphino Delgado		1	0	1	1	1	½
SantoRosa		1	0	1	1	1	½
Arullano		1	0	1	1	1	½

Account of Provisions expended on the ship on a voyage from to commencea June 1822.

Broached	Beef.	Pork.	Flour.	Peas.	Pilot bread.	Ship bread.	Bags rice.	Sour-crout.	Barrels potatoes.	Codfish.
June 10th, 1822.	1	1	1	1	1	1	1	1	1	1
17th,						1				
20th,	1	1								
26th,					1			1		

Bill of Lading.

Shipped, by the grace of God, in good order and well conditioned, by *S. T. R.* in and upon the good *ship* called the *Mary*, of *Philadelphia*, whereof is master for the present voyage *Thomas Smith*, now riding at anchor in the river Garonne, bound for *Philadelphia*, to say:

10 *pipes London proof brandy,*
1 *case assorted silks.*

Going for the sole account and sole risk, as the property of Henry Ortin, merchant, at Philadelphia, being marked and numbered as in the margin; and are to be delivered in the like good order, and well conditioned, at the aforesaid port of *Philadelphia*, (*the danger of the seas, and all other casualties excepted*) unto *Henry Ortin*, or to his assigns, he or they paying freight for the said goods, *four pounds sterling per ton, with ten per cent. primage, the whole going for five tons and a third*, with average accustomed. In witness whereof, the master of the said *ship Mary* hath affirmed to *four* bills of lading of this tenor and date; the one of which bills being accomplished, the other *three* to stand void; and so God send the good *ship* to her desired port in safety. *Amen. Contents and conditions unknown, and not to be accountable for leakage. One pipe of brandy, in dispute; if on board to be delivered; and it is agreed that the freight shall be paid for the quantity shipped.*

THOMAS SMITH.

Dated in Bordeaux, 20th January, 1822.

When any goods are to be carried on deck, it must be expressed in the bill of lading. (See page 582.)

Bill of Exchange.

Exchange for $50—July 2d, 1822.

Twenty days after sight of this my first of exchange, second, third, and fourth, of same tenor and date unpaid, pay to Mr. A. B., or order, fifty dollars, value received of F. G., which place to the account of your obedient servant,

J. R.

To C. H., merchant, Philadelphia.

In the second bill of exchange it must be mentioned, first, third, and fourth unpaid.

In the third—first, second, and fourth unpaid.

And in the fourth—first, second, and third unpaid.

Bills of Exchange must be written in a fair hand.

For further information on Bills of Exchange, see page 540.

Note of Hand.

$200.——

Sixty days after date, I promise to pay to Mr. G. C., or order, without defalcation, two hundred dollars, value received.

G. G.

Philadelphia, July 2d, 1822.

Without value received being expressed in a note of hand or bill of exchange, it is not good.

Bill of Parcels.

Mr. S. R.

Bought of L. W.

61 barrels of corn meal, at $4,	$244 00
Inspection on do. at 1 cent per bbl.	61
123 days interest on $244,	5 00
	$249 61

Philadelphia, July 2d, 1822.

Form of a Letter of Credit.

Letters of credit are granted by merchants or others, in favour of persons travelling into foreign countries. They are commonly open, or unsealed, and contain an order from the writer or granter to his factor or correspondent to furnish such a man, the bearer, with a certain sum, at one or several times, and to place it to the account of him who grants the letter. It is ordinary and necessary for the granter of a letter of credit to give his correspondent a letter of advice, by post or otherwise, in which he describes the person to be honoured with credit, from his stature, complexion, garb, or any mark on his body, or by some token, as he who can relate such a circumstance, &c. The design of which is to prevent fraud; for, the bearer of the letter may lose it, or he may be robbed, and it taken from him, and the finder or rogue go and present it. Letters of credit may be of various forms, and yet valid. We shall give only one specimen, as follows:

Mr. A. B.

SIR—The design of this is, to desire you to furnish and pay to the bearer hereof, Mr. T. R., to the value of twelve hundred dollars, at one or more times, as he shall have occasion, and as he shall require the same of you; for which take his receipt or bill of exchange on me; and this, my letter of credit, with mine of advice by the post, will be your sufficient warrant.

I am, sir, your humble servant,

C. D.

To Mr. A. B., merchant, in Paris.

Law Report.

Court of King's Bench, Westminster, April 27, 1822.

Freeman v. *the East India Company.*

The Solicitor General moved for a rule to show cause why the verdict in this case should not be set aside and a new trial granted. He stated that it was an action of trover tried before the Lord Chief Justice, at Guildhall, to recover the value of a quantity of indigo, now lying in the warehouses of the East India Company. The indigo in question was part of the cargo of the ship *Cerberus*, bound from Calcutta to England, which was wrecked off the Cape of Good Hope—but from which the indigo, with other goods, was saved by the exertions of the master and mariners. The captain, acting *bona fide* for the benefit of the owners, caused all the property saved to be surveyed and put up to public auction, where the indigo was purchased at the market price of the commodity in London. It appeared that the wrappers were wet, but none of them were taken off to ascertain whether the indigo had received injury. Before the arrival of the goods in England, the price had risen, as fairly speculated on by the purchasers; and in consequence of this rise the owners of the vessel sought, in this action to maintain that the captain had no authority to sell, and that therefore the purchasers had no right to retain. The Lord Chief Justice was strongly of this opinion, and the jury confirmed it by their verdict.

The Solicitor General now contended that the captain had a right to sell, and that the sale was therefore valid. In general, indeed, a captain was a mere carrier; but under some circumstances he was compelled to assume the character of supercargo and agent. It might be necessary for the interests of the owner, or, where the cargo was insured, of the underwriters, that the captain should have this discretionary power in cases of

wreck. There was no difference in principle between this case and that where goods were damaged, or where they were of a perishable nature; and it would be absurd to contend that where some small portion, as a single package, for example, was uninjured, the captain was bound to transmit it to his owners. At all events, here was a sale in market overt which transferred the property, even if the captain had no right to sell it; for it would be most prejudicial to the interests of commerce if a purchaser, buying goods at the public custom-house from one who had all the appearance of a general authority to sell, should be liable to have his bargain wrested from him, because in offering to sale one particular lot, the captain had exceeded his powers.

The court, however, were unanimously of opinion, that the direction of the Lord Chief Justice was right. A captain might hypothecate the ship and cargo, but beyond this he could not proceed unless there was an absolute necessity for sale. In cases were the goods were perishable, or where the materials of a vessel wrecked were alone saved, or where it was a sale of part of the cargo which was necessary for the purposes of the voyage, the character of the agent was forced upon him, and he might unquestionably sell. But here the voyage was ended by the wreck, the goods were not perishable, and might and ought to have been trans-shipped to England. A sale in *market overt* would, indeed, change the property, but with this one important exception: that it would be of no effect if the purchaser was acquainted with the infirmity of the contract. The rule was, therefore, refused.

Shipwreck.

The office of humanity to their fellow beings in distress is a duty, which, to the honour of seamen, has been generously and intrepidly exercised by them, in all cases where it has appeared to them practicable.—So strong indeed has been their desire to relieve the distressed, that the most imminent danger has not deterred them from attempting it; in which many, very many, have actually perished; yet notwithstanding this undisputed fact, a recent occurrence gives strong reason to suppose that many have perished in cases where relief might have been safely extended to them.

The ship Sea Fox, of New York, was upset in a squall. The ship John Adam, captain Night, afterwards fell in with her, in this condition, captain Night, desirous of rendering all possible assistance, sent his boat with his mate and four men to examine her, when they arrived on board they perceived a stick moving

through a hole in the deck, and heard a human voice, They therefore with all speed returned to the John Adam for an axe, scuttled the deck, and released three men from a horrible death. These men were in the forecastle when the ship was upset, and had broken through the bulkhead into the main hold, where they had subsisted several days on flour taken from the cargo. For this act of humanity, the captain, officers and seamen of the John Adam, were each presented with a silver tankard, by the citizens of New York, as a testimony of their respect.

Previous to the time at which the John Adam fell in with her, and immediately after her disaster, the Sea Fox had been boarded by the crews of several vessels, by the first of whom the captain and that part of the crew who were on deck, were taken off; but none entertained an idea that another living person was on board. Had they suspected this fact, several passengers, who were drowned in the cabin, might probably have been saved.

It is hoped that this melancholy example will be a sufficient inducement for seamen to board and search, when possible, all wrecks which they may meet with at sea, particularly such as are on their sides or bottom up, and to scuttle them, in order to render that relief which it is the pride of every seamen to give.

On Beaching a Boat.

The act of beaching a boat in a heavy surf, is attended with some danger under any circumstances, but much more dangerous when those who attempt it are not well acquainted with the manner in which it is to be performed. During the years 1789—90, I commanded a drogger for Messrs. King and Ruddach, in the Island of Tobago, in which service I acquired considerable experience in beaching, some rules for which are here subjoined.

If there is a heavy surf the boat must be backed stern in towards the beach, the better to keep her under command with the oars. When you arrive near the beach, wait for a smooth (which always follows every third sea); when that takes place, back in as fast as possible. As soon as the boat touches the beach, let the men jump out to steady her, and raise her bow to the surf, if the shore be not too steep, and when they receive the full force of the swell under her bow, let then hang on the gunwale until it subsides, and by repeating this, the persons or things may be landed, if the surf be not too violent.

I have known many boats to have been stove, and many lives

to have been lost, mostly through the ignorance of persons attempting to beach. When a boy, a schooner which I belonged to, from the Island of Grenada bound to the Island of St. Vincent, hove to off one of the Genadillas Islands, and three men and myself were sent in the boat to land a lady passenger on the beach. But on going bows on, from ignorance of the proper method, as soon as we reached the surf she upset, and with much difficulty all persons were saved. I may also remark, that the nails of the boat being rusty, some of the plank were bursted off, which detained us till the next day before we got the boat repaired. See page 331, on the necessity of fresh nailing boats.

It must be remembered, that at some small distance from the shore it will appear smooth, when at the same time it is very dangerous.

The manner of beaching a boat when drogging, differs from the above, of which it will be unnecessary to give directions, as no one will attempt it without being well acquainted with the manner of doing it, besides which they have boats particularly built for the purpose, with a spring in the keel, that is, the boat to draw about a foot less water both forward and aft, so that she may rise easy to the surf.

Cautions to Masters of Vessels.

It is highly adviseable for all persons, particularly masters of vessels, when going to many ports during the same voyage, to have their accounts closed at each port, and send a copy thereof to the merchant, and one to their friends. This may save a great deal of trouble, as many hath experienced.

If goods be lessened in their value during the voyage, and the damage arise from its being perishable in its own nature, the merchant shall not be at liberty to abandon them to the master for the amount of freight, although they be damaged, and of no value to him, such as Indian corn and many other articles.

In 1810 I was in the Havanna, when a brig arrived there from the United States laden with Indian corn; the corn being new, it became so heated on the passage that a great part was damaged, by which its value was so much lessened as to be insufficient to pay the freight: the supercargo, who also was the owner of the cargo, wished to abandon it to the master for the freight, the master would not receive it, and instituted a suit in the Consulado against the supercargo. The Consulado ordered a survey, on which I was one that was chosen, it was found that the vessel was tight, strong, and in good order, and that the da-

mage which the cargo had sustained, was in consequence of its own perishable nature, whereupon the supercargo was obliged to pay the freight.

It should be mentioned in the ship's articles, in case of death the wages of the deceased shall cease. If this be not so inserted, wages will be recovered by his friends, or divided among the rest of the crew. Not long since a seaman happened to fall overboard, and was drowned, the captain in consequence of neglecting the above precaution, was obliged to pay wages till return of the vessel, or till the day the voyage ended.

In a foreign port in small expenses, such as men's hire, fresh beef, &c., where vouchers cannot be procured—it should be regularly entered in the log-book, by the mate, both price and weight, &c., this may save a great deal of trouble as many have experienced, as the log-book will be the vouchers for the master in such a case.

A

METHOD

OF

CLEARING LUNAR DISTANCES

FROM THE

EFFECTS OF PARALLAX AND REFRACTION.

The following is a method for clearing lunar distances from the effects of parallax and refraction by projection, which is the same as by Kelly's, except that in place of a long calculation of multiplication and division in that method, I have introduced proportional logarithms, and consequently rendered it much easier and shorter. If the corrections are taken off the scale with care, it will give the true distance to a degree of exactness that one unacquainted with it would scarcely imagine. If the scale was enlarged and made of ivory, it would be very convenient. This method may serve as a corrector, that is to compare it with distances cleared by other methods.

Draw a vertical line at pleasure, which call the lunar line, as AB fig. 40, plate XXXI, to the right of which draw another line, making an angle with the former equal to the apparent distance (taken off the line of chords) AC, and let that be called the solar line; from the angular point A, lay off the sines of the sun and moon's apparent altitudes, or moon and star's altitude, on their respective lines, and mark the points ☽ and ✻, or ☽ and ☉ to which they extend. Through each of those points ☽ and ✻ or ☽ and ☉ draw perpendicular lines, lunar and solar, and mark where these two lines intersect in D. Then the distance D ☽ from this point to the place ☽ will give the first correction measured on the line of chords, reckoning each degree of the scale a mile, and let this be called the line of correction. When the line of correction falls on the right of the lunar line as in fig. 40, it is subtractive; but when it falls on the left as in figure 41, it is additive. From the line of correction, to find the true correction, multiply the given correction by the given horizontal parallax, and divide the product by 62 when the question is subtractive, but divide by 53 when the correction is additive, and it will give the true correction which is either additive or subtractive, according to the direction herein mentioned.

Example 1. *Fig.* 40.

Given the Moons apparent altitude	56° 20′
Stars apparent altitude	49° 48′
Apparent distance	72° 36′ 13″
Moon's horizontal parallax	59′ 9″

To find the true distance by projection, draw the lunar line at pleasure AB, and draw the line AC to make an angle with the former equal to the apparent distance; from the point A lay off the sign of the moon's apparent altitude AC, and that of the stars equal to A✱ the star's apparent altitude.

Through the point ☽ and ✱ draw perpendicular lines, which will intersect in D; the line D☽ is the first correction, which being measured on the line of chords, and calling each degree a mile, will be found equal to 32′, and this being on the solar or star side of the lunar line, is subtractive; multiply it by the given horizontal parallax, and the product divide by 62, which gives 30′ 32″, which subtract from the apparent distance, viz.

Apparent distance	72° 36′ 13″
Second correction subtract	30′ 32″
True distance	72° 5′ 41″

As logarithms are constructed to facilitate the calculation of multiplication and division, so that by them multiplication is performed by addition, and division by substraction.

EXAMPLE.

The first correction 32′ prop. log.	7501
Moon's horizontal parallax 59′ 9″ prop. log.	4833
	1.2334
The divisor 62′ prop. log. subtract	4629
Prop. log. of the difference gives 30′ 32″	0.7705

The same as above.

Example 2. *Fig.* 41.

Given moon's apparent altitude	40° 00′
Stars apparent altitude	20° 00′
Apparent distance	30° 00′
Moon's horizontal parallax	60′

Plate XXXI

Fig: 40.

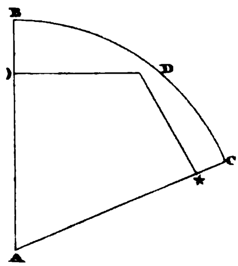


Fig: 41.

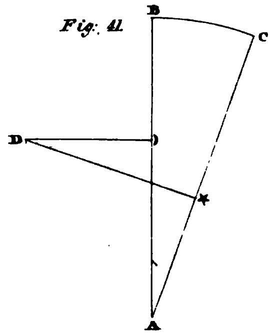


Fig: 42.

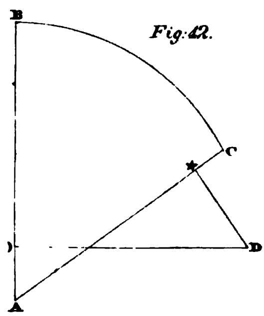


Fig: 43.

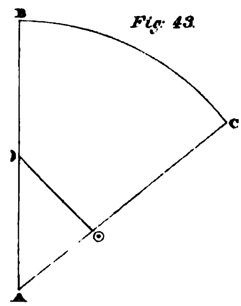


Fig: 44.

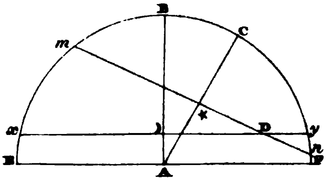
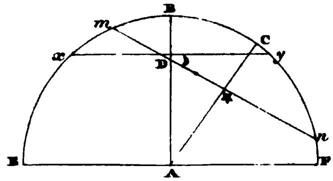


Fig: 45.



En. by J Warr Jr. Philad.a

To find the true distance, draw the lines ABC as before, making the angle A equal to 30° 00′ the apparent distance, lay off A☽ and A✱ equal to the signs of their apparent altitude. Then, through ✱ and ☽ draw perpendicular lines, which will intersect in D, then is the line D☽ equal to 24° 14′ on the line of chords, which call 24′ 14″ the first correction, and being on the contrary side of the star that is on the left side of the lunar line, it is additive; then 24′ 14″ being multiplied by 60′ the given horizontal parallax, and divided by 53′ will give 27′ 27″, the second correction being added to 30° 00′ the apparent distance will give the true distance, 30° 27′ 27″.

Or by prop. logarithms:

First correction 24′ 14″ prop. log.	8706
Moon's horizontal parallax 60′ prop. log.	4771
	1.3477
53 prop. log.	5310
Prop. log. of second correction 27′ 27″	0.8167

Which being added to the apparent distance, gives the true distance.

Example 3. *Fig.* 42.

Given in the moon's apparent altitude	10° 00′
Star's apparent altitude	70° 00′
Apparent distance	60° 00′
Moon's horizontal parallax,	60′

Let ABC be described to an angle at A equal to 60° the apparent distance, and lay off from the line of sines A ☽ and A ✱ equal to the moon and star's apparent altitudes respectively. Through ☽ and ✱ draw perpendicular lines which will meet in D, then is D ☽ equal to 56° 00′ on the line of chords, calling each degree on the scale a mile, which is the first correction, then 56 × 60 ÷ 62 is equal to 54′ 12″, the second correction which is subtractive from the apparent distance being on the right side of the lunar line will give the true distance.

Example by Proportional Logarithms.

Prop. Log. of first correction 56′ 00′		5071
Prop. Log. of moon's Hor. Par.		4771
	Sum	9842
Prop. Log. 62′		4629
Difference gives prop. log. of second correction 54′ 12″		5213

Apparent distance	60 00 00
Second correction	54 12
True distance	59 05 48

Example 4. *Fig.* 43.

Given the moon's apparent altitude	24° 00′
Sun's apparent altitude	18° 00′
Apparent distance	44° 00′
Moon's horizontal parallax	56′ 30″

To find the correction and apparent distance,

Describe ABC as before, making an angle at A equal to the apparent distance, lay off A ☽ and A ☉ equal to the sine of the sun and moon's apparent altitudes respectively; through ☽ and ☉ draw perpendicular lines, which in this case will meet in ☽, therefore it appears there is no correction to be made, so that the apparent distance will be the true distance.

Example 5. *Fig.* 44.

The following example in projection may be performed with equal facility and accuracy, by the scale of chords only, when the apparent distance is not more than 90°.

Given the moon's zenith distance	80° 00′
Star's zenith distance	60° 00′
Apparent distance	24° 00′
Moon's horizontal parallax	60′

To find the true distance:

With the chord of 60° describe the semicircle EBF, make EB the lunar line, and make AC equal to an angle of 24° to equal the apparent distance; lay off 80° the moon's zenith distances, (measured on the line of chords,) both ways from B to X and Y, and draw the line XY, then lay off the star's zenith distance 60° both ways, from C to M and MN; observe where MNXY intersect in D, and D ☽ is the line of correction, which falling on the right side of the lunar line it is subtractive, then multiply the first correction by the given horizontal parallax 60′ anddivide by 62 gives the second correction, or by proportional logarithms, as in the preceding rules.

1st Cor.	48′ 45″	Prop. Log.	5673
Hor. Par.	60′	Prop. Log.	4771
			1.0444
Prop. Log. of 62′			0.4629
Prop. Log. of Second Correction	47′ 11″		0.8515

Ap. Dist.	24° 00′ 00″
Second Cor.	47′ 11″
True distance	23° 12′ 49″

Example 6. *Fig.* 45.

Given the moon's zenith distance	30° 26′ 0
Star's zenith distance	42° 50′ 0
Apparent distance	27° 29′ 43″
Moon's horizontal parallax	54′ 43″

The correction from ☽ to D measured on the line of chords, will reach 4°, calling each degree a mile, will be four miles, which multiply by the given horizontal parallax, and as the first correction falls on the left side of the lunar line, divide by 53, which will give 14′ 14″ for the second correction, falling on the left side of the lunar line, it is additive to apparent distance, or by proportional logarithms.

First correction 4′ prop. log.	1.6532
Moon's hor. par. 54′ 43″ prop. log.	5172
Sum	2.1704
The dividend 53′ prop. log. subt. gives 4′ 8″	5310
Prop. log.	1.6394

Apparent distance	27°	29°	43″
Second correction		4	8
True distance	27	33	51

N. B. The apparent zenith distances, are found by subtracting the apparent altitudes from 90°.

On taking a Lunar Observation when there is only one Observer.

A lunar observation may be obtained by only one observer in the following manner:

Suppose the angular distance between the sun and moon to be increasing, lap them sufficiently, so as to allow time to read off the angular distance, and to set it down on the slate, then observe when their limbs are in contact, and as soon as that is done, take the altitude of the sun, with the same sextant, and by having a quadrant at hand, lay down the sextant, and with the quadrant take the altitude of the moon. This operation may be performed in so short a time, that little or no allowance need be made.

N. B. If the distance be decreasing, it may be performed by separating the objects, and waiting till they come in contact.

Since my remarks on the Andes, page 132, went to press, I have ascertained from Mr. Darby, at his lecture-room, Philadelphia, that the Hymmalaya Mountains are the highest in the

known world. Of these there are many peaks, some of which are rated to be 35,000 feet above the level of the sea. Some are actually known by measurement to be 28,000 feet. Of these peaks from twenty to thirty are higher than Chimboraco or Chimborazo, of the Andes, in South America. These mountains are in Asia, in lat. about 30° N. and long. 90° east from Greenwich.

Cape Horn, Valparaiso, and Lima.

The following information, though not extensive, may be of importance to those who may happen in a port where directions cannot be procured:

I have been informed by a captain of a whaling ship, who has doubled Cape Horn at all seasons of the year, that the best route in doubling this cape outward bound, is, if possible, to keep out of sight of land, so that advantage may be taken of shifts of wind to sail on either tack, as circumstances require.

Cape Horn is at the extremity of South America. It is the most southern headland of the Island of Terra del Fuego, round which ships pass in going out of the South Atlantic Ocean, westward, into the South Pacific Ocean. It is in lat. 55° 58′ S. and long. 67° 22′ W., and is also situated on a small island, having Nassau Bay within that and Hermit's Islands. It may be known at a distance by a high round hill over it, and two peaked rocks like sugar loaves on its N. W. side, in the direction of N. by W. and S. by E. from each other. There is a point to the W. N. W. which has the appearance not much unlike that of the Cape, but they will be readily known from each other by their situation. There are some straggling low rocks to the west of the Cape, and one at the south, but they are all near the shore. Christmas Sound is 31 leagues W. N. W. ¾ W. from the Cape. Between this Cape and Mistaken Cape, there appears to be a passage directly into Nassau Bay; but it has not been correctly explored to affirm it with certainty. The western coast appears to form several good bays and harbours. Cape Horn is said to be the south point of Hermit's Island. False Cape Horn is at the south point of the larger Island of Terra del Fuego, on the east side of which is the entrance to Nassau Bay, which is north of the Hermit's Islands, and turns round to N. W. within this Cape. It is frequently called Mistaken Cape, and lies to the N. E. from the true Cape Horn about three leagues.

Valparaiso, *Port* or *Bay*, on the coast of Chili, is on the South Pacific Ocean, and the west coast of South America. It

is two leagues to the W. N. W. from Cape Curaoma. On turning the point bound for the harbour, range close along a shoal that shows itself within about half a cable's length from the shore, in order to keep to windward. This shoal consists of a ledge of rocks that becomes dry in some parts, but it is pretty bold. Ships that keep off too far are often obliged to make several tacks to recover the road, the anchoring place being high up the river. Bring the point of Valparaiso N. E. by N., the white battery W. S. W., and Cape Caucon N. by E., and a ship will find the best anchoring birth in twenty-seven fathoms, in oozy ground, and sheltered from all winds; its lat. is 33° 1′ S., and long. 71° 37′ W. This harbour is well frequented, particularly by coasters, to load corn for Callao and Panama. Pilots may be had here for almost any part of the coast, especially to the northward; the coasting vessels lie close into the town, and make fast their cables to the shore either to piles or great stones with rings in them; and although so near shore, they have eight or ten fathoms water. On account of the breezes which regularly come about noon from the S. and S. W., and blow so strong that vessels place no dependence on their anchors; this is an excellent way of securing ships; but care must be taken of a shoal within a cable's length of the shore, near the battery of the White Castle, on which there is only thirteen or fourteen feet at low water, and the sea rises only six feet at most. These are the only dangers in this bay, being in all other respects very safe, and ships may tack in from eight to fifty fathoms, and anchor every where. In turning or beating to the eastward towards the Seite Harmanas, or Seven Sisters, come no nearer the shore than three cables' length, opposite to a running brook, that is crossed by a broad reddish highway, as there is a shoal in that place that has only two fathoms and a half water in it. It must be remembered that ships usually ride in the nook or angle of this road before the battery of Castillo Blanco; this being a very convenient situation for trade, as well as security from pirates and rovers. In winter it is however a bad road, because the north winds blow right in and make such a high sea, that ships are often drove ashore in spite of all their moorings ahead and astern. In summer the south winds are equally violent, but they blow from the land, and therefore make no sea; and if the ship should drive she may put to sea, and return in the evening when the wind always abates.

The river which goes up to the city of St. Jago many leagues inland, is not navigable up to the city, but all the business is done at Valparaiso. Large quantities of hemp, that is brought down the river on rafts formed of bladders and skins, are loaded here.

The point Conception is at N. by E. and partly within the bay, into which the river Aconcagua empties itself. This port of Valparaiso has sometimes been called San Tiago, but it has more usually the present name.

LIMA RIVER, on the coast of Peru, and the South Pacific Ocean, has a city of the same name about seven miles from the sea—Callao is the place where all the commerce of the city is transacted, this river consequently cannot be navigable.

Callao is the port town of Lima, situated on a small island opposite to it; in latitude 12° 3′ S. and longitude 77° 1′ W. The river and town of Callao is about three miles S. W. from Lima river, and betwixt them near shore, is from four and a half to five and a half fathoms water, and from Callao to a cape or narrow point of land, also to the S. W. is from five to eight fathoms; on the west side of the cape is but one fathom, and a half, and on the north, three fathoms near the shore, Lorenzo Island is somewhat more than two miles west from Callao cape, and La Laja, a very small island, lies in the midway between them. Round the cape on the south side is shoal water more than a mile from the shore; but two miles east from it is three fathoms; and from thence for four leagues to the southeast the coast forming a kind of a bay, is from four to six fathoms, at two or three miles N. E. from port China, off a point at that distance, there commences a shoal.

The hunch-backed rock is four miles S. by E. from the cape, with the Ordada rock and several smaller ones to the east of that; but there is from nine to sixteen fathoms round them.

Callao Road is the best of any which the South Sea affords; being safe riding, clear ground, deep water, gradual soundings as well above the town towards Les Piscadores, as below it to St. Lawrence Island, you may turn in or out, as occasion may require, or the wind or weather will permit: to come in from sea, give the cape a good birth of a league at least, because of the winds off shore; for if you be nearer, the wind comes off in strong flaws and gusts—and off the windwardmost point of the capes, is a small ledge of rocks. In coming from the windward channel, between Callao point and the Island of Callao, the Bouqueron must be passed through, the wind always favouring it; small ships go in right before it. Callao Island and port are five leagues from each other, bearing from each other N. E. and S. W. In the passage of Bouqueron, take notice of a break or clift in the high lands of the island, having a white spot on the top of it; then incline a little towards the port of Callao, but still give a birth to the shoal, which in that situation is to the E. or N. E. Come no nearer the point, even in steering in, so as at least to keep the north headland of the island to the westward, this offing will carry a ship safely in, so as to

come to an anchor in the Road in any depth, in oozy ground, the only rock or shoal is about three cables' length from the shore, near a point of St. Lawrence Island, opposite to La Galera point, the most westerly on the same island.

The sea is always so still here, that ships careen at all seasons, without fear of sudden gusts of wind, which are frequent farther to the south, and though the road is open to the N. and N. N. W. these winds so seldom blow here, that no danger is apprehended, because whenever there is such winds, they never exceed a gentle easy breeze, so that it never occasions much swell to do any damage.

The Island of St. Lawrence also breaks off the sea from the S. W. to the S. E. All sorts of convenience are to be had at port Callao, and water is very readily procured in a small river that comes down from Lima, and bears the name of that city, which fall into the sea under the very walls of Callao: from Callao to Lima is about two leagues by land.

An Explanation of the Principal Terms made use of in Astronomy.

A

Aberration, an apparent change of place in the fixed stars, which arises from the motion of the earth combined with the motion of light.

Achronical rising or setting of a planet or star, is when it rises at sunset, or sets at sunrise.

Almicanters, certain imaginary circles, which, in every position of the globe, are supposed to be drawn parallel to the horizon.

Altitude, the height of the sun, moon, or stars, above the horizon, reckoned upon a vertical circle, in degrees, minutes, &c.

Amphiscii, a name given to the inhabitants of the torrid zone, on account of their shadows falling at one time of the year towards the north, and at another time towards the south.

Amplitude, an arc of the horizon contained between the east or west point of the heavens, and the centre of the sun or a star, at the time of its rising or setting.

Angle, the inclination or opening of two lines meeting in a point.

Anomaly, (True) the distance of a planet in signs, degrees, &c. from that point of its orbit which is the farthest from the sun.

Anomaly, (Mean) is that which would take place if the planet moved uniformly in the circumference of a circle.

Antœci, a name given to those inhabitants of the earth, who live under the same meridian, and at equal distances from the equator, but on opposite sides of it.

Antecedentia, a motion of any of the heavenly bodies which is contrary to the order of the signs; as from Aries towards Pisces, &c.

Antipodes, those inhabitants of the earth who live diametrically opposite to each other, or walk feet to feet.

Aphelion, that point in the orbit of a planet in which it is at its greatest distance from the sun.

Apogeon, that point in the orbit of a planet in which it is at its greatest distance from the earth.

Apsides, two points in the orbit of a planet in which it is at its greatest and least distance from the sun: the line joining those points is called the line of the Apsides.

Armillary Sphere, an instrument composed of the principal circles which are usually drawn upon an artificial globe.

Ascii, the inhabitants of the torrid zone, so called because the sun being twice a year in their zenith, their bodies at those times cast no shadow.

Ascensional Difference, an arc of the equinoctial contained between that point of it which rises with the sun, moon, or star, and that which comes to the meridian with them; or it is the time the sun rises or sets before or after six o'clock.

Atmosphere, that collection of vapours, or body of air, which surrounds or encompasses the earth.

Attraction, a property of matter, by which bodies approach towards each other, without any sensible agent either drawing or impelling them.

Aurora, the morning twilight, which begins to appear when the sun is about eighteen degrees below the horizon.

Axis of the earth, or of a planet, an imaginary line passing through the centre from one pole to the other; or that round which they are supposed to perform their diurnal rotations.

Azimuths, great circles which pass through the zenith and nadir, and are perpendicular to the horizon. The azimuth of any celestial object is an arc of the horizon contained between the east or west points of the heavens, and a vertical circle passing through the centre of that object.

C

Centrifugal Force, that force by which any revolving body endeavours to fly off from the centre of motion, in a tangent to the circle which it describes.

Centripetal Force, that force by which any revolving body is made to tend towards the centre. See page 438.

Conjunction, is when two stars, seen from the sun or the earth,

appear in the same point of the heavens, or answer to the same degree of the ecliptic.

Constellation, a number of stars lying in the neighbourhood of each other, which astronomers, for the sake of remembering them with more ease, suppose to be circumscribed by the outlines of some animal, or other figure.

Cosmical rising or setting of a planet or star, is when it rises with the sun in the morning, or sets with him in the evening.

Consequentia, a motion of the planets according to the order of the signs; as from Aries towards Taurus, &c.

Culminating, a term applied to the sun or a star when it comes to the meridian of any place.

Cycle of the moon, a revolution of nineteen years, in which time the conjunctions and lunar aspects are nearly the same as they were nineteen years before.

D

Day, (natural,) that portion of time in which the earth completes an entire revolution upon its axis.

Day, (artificial,) the time between the sun's rising and setting; to which is opposed night, or the time between his setting and rising.

Day, (astronomical,) the time between two successive transits of the sun's centre over the same meridian; which always begins and ends at noon.

Declination of the sun, moon, or stars, is their distance north or south from the equator, reckoned in degrees, minutes, &c. upon a circle which is perpendicular to it.

Direct, a planet is said to be direct, when it moves according to the order of the signs; as from Aries towards Taurus, &c.

Disk of the sun, or moon, is its round face, which, on account of the great distance of the object, appears flat, or like a plane surface.

Digit, in Astronomy, the 12th part of the sun's diameter, which is often used in the calculation of eclipses.

Diurnal, of or belonging to the day; thus, the diurnal motions of the planets are the spaces they move through in a day.

Dominical Letter, one of the first seven letters of the alphabet, which is usually marked in red, and employed in the Almanac for distinguishing the Sundays throughout the year.

E

Eccentricity, the distance between the centre of an ellipsis and either of its foci.

Eclipse of the sun, an obstruction of his light, occasioned by the interposition of the dark body of the moon between him and our sight.

Eclipse of the moon, a deprivation of her light, occasioned by the interposition of the earth between the sun and moon.

Ecliptic, a great circle of the sphere, in which the sun always appears to move; so called, because eclipses generally happen when the moon is in or near this circle. The obliquity of the ecliptic is the angle it makes with the equator, which is about 23° 27′ 53″, in 1822.

Elevation of the Pole, is an arc of the meridian contained between the pole and the horizon; which is always equal to the latitude of the place, or the distance of the zenith from the equator.

Elongation, the angular distance of a planet from the sun, as it appears to a spectator upon the earth.

Elements, in Astronomy, the requisites necessary to determine the theory of a planet, in order to calculate its position, motion, &c.

Ellipsis, a figure formed by cutting a cone obliquely to its axis: it is in a curve of this kind that the planets move round the sun, and the satellites round their primaries.

Emersion, the time when any planet which is eclipsed begins to recover its light again.

Epact, the moon's age at the end of the year, or the difference between the solar year and the lunar one.

Equations, certain quantities by which we estimate the inequalities in the motion of a planet: the moon, being subject to many irregularities, has a great number of equations.

Equation of time, the difference between equal time and apparent, or that shown by a perfectly true clock and a sun dial.

Equator, a great circle which separates the northern from the southern hemisphere, and being referred to the heavens is called the *Equinoctial.*

Equinoxes, the two points where the ecliptic cuts the equator; so called, because, when the sun is in either of these situations, the days and nights are equal to each other.

Evection, an inequality in the motion of the moon, by which, at her quarters, her mean place differs from her true one by about 2½ degrees more than at her conjunction and opposition.

F

Foci of an ellipsis, two points in the longest or transverse axis, on each side of the centre; from each of which, if any two right lines be drawn to meet in the periphery, their sum will be always equal to the transverse axis.

G

Geocentric place of a planet, is that position which it has when seen from the earth.

Golden Numbers, a series of numbers proceeding from one to nineteen, which are used in the almanac for determining the times of new and full moons.

Gregorian Year, so called from Pope Gregory XIII. who reformed the calendar in the year 1582; which reformation was not used in England till 1752.

H

Heliacal rising of a star, is when it emerges from the sun's rays, and appears above the horizon before him in the morning.

Heliacal setting of a star, is when it is so hidden in the sun's beams, as not to be seen above the horizon after him in the evening.

Heliocentric place of a planet, is that in which it would appear to a spectator placed in the sun.

Hemisphere, the half of a globe or sphere, when it is cut through its centre in the plane of one of its great circles.

Heteroscii, a name given to the inhabitants of the temperate zones, because their shadows at noon always fall one way.

Hour Circles, the same with meridians, or great circles which pass through the poles of the world, and are perpendicular to the equator.

Hypothesis, a supposition, a system formed upon some principle which has not been proved.

I

Immersion, the moment when an eclipse begins, or when a planet enters into the dark shadow.

Inclination, the angle which the orbit of one planet makes with that of another.

Indefinite, or Indeterminate, that to which the human mind cannot fix any certain bounds or limits.

Inferior Planets, those which move at a less distance from the sun than the earth; as Mercury and Venus.

Ingress, is the sun's entrance into any sign or other part of the ecliptic.

Intercalary Day, the odd day, which is made up of the six hours every fourth or leap year.

L

Latitude of a star or planet, is its distance from the ecliptic, reckoned in degrees, minutes, &c. upon the arc of a great circle which is perpendicular to it.

Libration, an apparent irregularity of the moon's motion, which makes her appear to librate about her axis, in such a manner that the parts of her eastern and western limbs becomes visicle and invisible alternately.

Longitude of a place, is its distance east or west from the

first meridian, reckoned in degrees, minutes, &c. upon the equator.

Longitude of a star or planet, is its distance from the first point of Aries, reckoned in degrees, minutes, &c. upon the ecliptic.

Lunation, a lunar synodical month, or the space of time between one new moon and another, which is generally about 29 days, 12 hours, 44 minutes, and 3 seconds, being greater than the periodical month by two days and five hours.

Luni-Solar Year, a period arising from multiplying the cycle of the moon 19 by that of the sun 28.

M

Maculæ, dark spots, appearing on the face of the sun, moon, and some of the planets, being contradistinguished from Faculæ, which are bright or shining spots, that by means of the telescope are sometimes to be seen on the face of the sun, &c.

Magnitudes. The stars are divided into six sizes, or classes, of which the brightest are called stars of the first magnitudes; the next in brightness to these, stars of the second magnitude; and so on.

Mean motion of a planet, is that which would take place if it moved in a perfect circle, and equally every day.

Meridian, a great circle of the sphere, which passes through the zenith and poles, and is perpendicular to the horizon; it is so called because when the sun is upon the circle it is always mid-day, or noon.

Micrometer, an instrument by which the apparent magnitudes of objects, viewed through telescopes or microscopes, are measured with great exactness.

Microscope, an optical instrument, by means of which very minute objects are represented much larger, and viewed distinctly at small distances.

Month, (lunar or periodical) a period of about twenty-seven days, seven hours, and forty-three minutes, which is the time the moon is in passing from one point of her orbit to the same point again.

N

Nadir, that point in the heavens which is directly opposite to the zenith, or immediately under our feet.

Nebulæ, clusters of small stars which have been discovered by the telescope in different parts of the heavens.

Nocturnal Arc, is that space of the heavens which the sun apparently describes from the time of his setting to the time of his rising.

Nodes, the two points where the orbit of a planet intersect the plane of the ecliptic.

Nonagesimal Degree, the 90th degree, or highest point of the ecliptic, at any given time of the day or night.

Northern Signs of the ecliptic, are those six which lie to the north of the equinoctial; as Aries, Taurus, Gemini, Cancer, Leo, and Virgo.

Nucleus. a term used by some astronomers for the head of a comet, and by others for the central parts of the planets.

O

Oblique Ascension, is an arc of the equinoctial contained between the first degree of Aries, and that point of it which rises with the centre of the sun or a star.

Oblique Sphere, is that position of the globe in which either of the poles is elevated above the horizon any number of degrees less than ninety.

Occultation, is when a star or planet is hidden from our sight by the interposition of the moon, or some other planet.

Octant, an aspect of the planets when they are forty-five degrees distant from each other.

Opposition, an aspect of the stars or planets when they are a hundred and eighty degrees distant from each other; which in the Ephemeris is marked ☍.

P

Parallax, the difference between the places of any celestial object, as seen from the surface of the earth and from its centre.

Parallax of the earth's annual orbit, is the angle at any planet which is subtended by the distance between the sun and earth; or it is that change of place in the planets, which arises from their being seen from different points of space, as the earth moves round the sun.

Parallels of latitude, small circles of the sphere, which are drawn parallel to the equator.

Penumbra, a faint shadow which accompanies an eclipse, and occasions a partial obscurity of the body to that part of the earth on which it falls.

Periœci, those inhabitants of the earth who live under the same parallels of latitude, but on opposite sides of the meridian.

Perigeon, that point of a planet's orbit in which it is at its least distance from the earth.

Perihelion, that a point of a planet's orbit in which it is at its least distance from the sun.

Period, a certain length of time after which eclipses and other

celestial phenomena return again in nearly the same manner as before.

Periphery, the circumference of a circle, ellipse, or any other regular figure.

Periscii, the inhabitants of either of the frozen zones; so called, because their shadows go round them for six months, or fall towards opposite points of the compass.

Phases, the several appearances of the moon and planets, according as a greater or less part of their illuminated hemispheres are presented to our sight.

Plane, in astronomy, is frequently used for an imaginary surface, which is supposed to cut and pass through solid bodies; and in this sense we are to understand the plane of a planet's orbit.

Planetarium, an instrument made use of for showing the phenomena of the planets; see Plate XXI.

Polar Circles, two small circles of the sphere, twenty-three degrees and a half distant from the poles: that about the north pole is called the arctic circle, and the one about the south pole the antarctic circle.

Poles of the world, those two points which are at the extremities of the earth's axis; or, when referred to the heavens, the two points directly over them.

Precession of the equinoxes, a slow motion of the two points where the equator intersects the ecliptic, which are found to go backwards about fifty seconds a year.

Projectiles, such bodies as being put into motion by any particular force, continue to move with a certain velocity, either in a straight line, or a curve, according to circumstances; such as a stone thrown from a sling, an arrow from a bow, or a ball from a gun.

Q

Quadratures, or Quarters; those phases of the moon which take place between the conjunction and opposition, and between the opposition and conjunction: one being called the first quarter, and the other the third.

Quiescent, the state of a body which is at rest, or in opposition to motion.

R

Retrograde, an apparent motion of the planets in some parts of their orbits, when they seem to go backwards, or contrary to the order of the signs.

Revolution, is that motion by which the heavenly bodies, in a certain time, return again to the same points of their orbits.

Right Ascension, is that degree of the equator which comes to the meridian with the sun, moon, or star, reckoning from the first point of Aries.

Rotation, the motion of any heavenly body round its axis.

S

Satellites, secondary planets, or moons which revolve round the primary planets in the same manner as those primaries revolve round the sun, and of which the magnitude is about a thousand times greater than that of the earth.

Secondary circles of the sphere, are those circles which pass through the poles of some great circle: thus the meridian and hour circles are secondaries to the equinoctial, &c.

Sidereal, of or belonging to the stars or planets.

Sidereal Year, is that space of time which the sun takes in moving through the ecliptic, from any fixed star to the same star again.

Solstitial Points, are the two points of the zodiac, Cancer and Capricorn, at which the ecliptic touches the tropics, and into which the sun enters on our longest and shortest days.

Stationary; a planet is said to be stationary when it has no apparent motion.

Style, the manner of reckoning time from some particular period or remarkable event.

Superior Planets, are those which move at a farther distance from the sun than the earth; as Mars, Jupiter, Saturn, and the Gergium Sidus.

Synodical Month, the space of time from any new moon to the following one, which is at a mean twenty-nine days, twelve hours, and forty-five minutes.

System, a number of bodies revolving round a common centre, as the planets and comets move round the sun.

Syzygies, those points of the moon's orbit in which she is at the time of her new and full.

T

Telescopic Stars, those stars which are only discoverable by means of a telescope.

Temperate Zones, those parts of the earth contained between the tropics and polar circles.

Theory, any doctrine of which the principles only are explained, without considering the practical uses and application of it.

Torrid Zone, that part of the earth which is contained between the two tropics.

Transit, is the passing of one celestial body before another, so as to render any part of it invisible.

Twilight, is that faint light which we perceive before the rising of the sun, and after his setting, and which is occasioned by the refraction of the earth's atmosphere.

V

Vertical Circles, the same as Azimuth Circles, or such as are drawn perpendicular to the horizon.

Moon's Hor. Par. ′ ″	Apparent altitude of Moon's centre. 5° 00′	5° 10′	5° 20′	5° 30′	5° 40′	5° 50′	6° 00′	6° 10′	6° 20′	6° 30′
54 0	3101	3075	3050	3025	3003	2982	2962	2941	2924	2907
10	3084	3058	3033	3009	2987	2966	2946	2926	2908	2891
20	3068	3041	3016	2993	2971	2950	2930	2911	2892	2875
30	3051	3025	3000	2977	2955	2934	2914	2895	2877	2860
40	3035	3009	2984	2961	2939	2918	2898	2879	2861	2844
50	3019	2993	2968	2945	2923	2902	2883	2864	2846	2828
55 0	3003	2977	2952	2929	2907	2887	2867	2848	2830	2813
10	2987	2961	2936	2913	2891	2871	2851	2833	2815	2798
20	2971	2945	2921	2898	2876	2855	2836	2817	2799	2782
30	2955	2929	2905	2882	2860	2840	2820	2802	2784	2767
40	2939	2913	2889	2866	2845	2824	2805	2786	2769	2752
50	2923	2897	2873	2851	2829	2809	2790	2771	2753	2737
56 0	2907	2882	2858	2835	2814	2793	2774	2756	2738	2721
10	2891	2866	2842	2820	2798	2778	2759	2741	2723	2706
20	2876	2851	2827	2804	2783	2763	2744	2725	2708	2691
30	2860	2835	2811	2789	2768	2748	2729	2710	2693	2676
40	2844	2820	2796	2774	2752	2732	2714	2695	2678	2661
50	2829	2804	2780	2758	2737	2717	2698	2680	2663	2647
57 0	2813	2789	2765	2743	2722	2702	2683	2665	2648	2632
10	2798	2773	2750	2728	2707	2687	2669	2650	2633	2617
20	2783	2758	2735	2713	2692	2672	2654	2636	2618	2602
30	2767	2743	2720	2698	2677	2657	2639	2621	2604	2588
40	2752	2728	2705	2683	2662	2642	2624	2606	2589	2573
50	2737	2713	2690	2668	2647	2628	2609	2591	2574	2558
58 0	2722	2698	2675	2653	2632	2613	2595	2577	2560	2544
10	2707	2683	2660	2638	2618	2598	2580	2562	2545	2529
20	2692	2668	2645	2623	2603	2584	2565	2548	2531	2515
30	2677	2653	2630	2609	2588	2569	2551	2533	2516	2501
40	2662	2638	2615	2594	2574	2554	2536	2519	2502	2486
50	2647	2623	2601	2579	2559	2540	2522	2504	2488	2472
59 0	2632	2608	2586	2565	2544	2525	2507	2490	2473	2458
10	2617	2594	2571	2550	2530	2511	2493	2476	2459	2444
20	2603	2579	2557	2536	2516	2497	2479	2461	2445	2429
30	2588	2565	2542	2521	2501	2482	2465	2447	2431	2415
40	2573	2550	2528	2507	2487	2468	2450	2433	2417	2401
50	2559	2535	2513	2492	2473	2454	2436	2419	2403	2387
60 0	2544	2521	2499	2478	2458	2440	2422	2405	2389	2373
10	2530	2507	2485	2464	2444	2426	2408	2391	2375	2359
20	2515	2492	2470	2450	2430	2411	2394	2377	2361	2345
30	2501	2478	2456	2435	2416	2397	2380	2363	2347	2332
40	2487	2464	2442	2421	2402	2383	2366	2349	2333	2318
50	2472	2450	2428	2407	2388	2369	2352	2335	2319	2304
61 0	2458	2435	2414	2393	2374	2356	2339	2321	2306	2290
10	2444	2421	2400	2379	2360	2342	2325	2308	2292	2277
20	2430	2407	2386	2365	2346	2328	2311	2294	2278	2263
30	2416	2393	2372	2351	2332	2314	2297	2280	2265	2250
40	2402	2379	2358	2338	2318	2300	2283	2267	2251	2236

TABLE A.

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	° ′ 6 40	° ′ 6 50	° ′ 7	° ′ 7 3	° ′ 7 6	° ′ 7 9	° ′ 7 12	° ′ 7 15	° ′ 7 18	° ′ 7 21
54 0	2889	2875	2860	2856	2851	2846	2842	2838	2834	2830
10	2874	2859	2844	2841	2836	2831	2827	2823	2819	2815
20	2859	2843	2828	2825	2821	2816	2812	2808	2804	2800
30	2843	2827	2813	2810	2805	2800	2796	2792	2788	2784
40	2828	2812	2797	2794	2790	2785	2781	2777	2773	2769
50	2812	2797	2782	2779	2774	2770	2766	2762	2758	2754
55 0	2797	2781	2767	2764	2759	2755	2751	2747	2743	2739
10	2781	2766	2751	2748	2744	2739	2735	2731	2727	2723
20	2766	2751	2736	2733	2729	2724	2720	2716	2712	2708
30	2751	2736	2721	2718	2714	2709	2705	2701	2697	2693
40	2736	2720	2706	2703	2699	2694	2690	2686	2682	2678
50	2721	2705	2691	2688	2684	2679	2675	2671	2667	2663
56 0	2706	2690	2676	2673	2669	2664	2660	2656	2653	2649
10	2690	2675	2661	2658	2654	2649	2645	2641	2638	2634
20	2676	2660	2646	2643	2639	2635	2631	2627	2623	2619
30	2661	2646	2631	2628	2624	2620	2616	2612	2608	2604
40	2646	2631	2617	2614	2610	2606	2602	2598	2594	2590
50	2631	2616	2602	2599	2595	2591	2587	2583	2579	2575
57 0	2616	2601	2587	2584	2580	2576	2572	2568	2564	2560
10	2601	2587	2573	2570	2566	2562	2558	2554	2550	2546
20	2587	2572	2558	2555	2551	2547	2543	2539	2535	2531
30	2572	2557	2543	2540	2536	2532	2528	2524	2521	2517
40	2558	2543	2529	2526	2522	2518	2514	2510	2506	2503
50	2543	2528	2515	2512	2508	2504	2500	2496	2492	2488
58 0	2529	2514	2500	2497	2493	2489	2485	2481	2478	2474
10	2514	2500	2486	2483	2479	2475	2471	2467	2463	2460
20	2500	2485	2472	2469	2465	2461	2457	2453	2449	2445
30	2485	2471	2457	2454	2450	2446	2442	2438	2435	2431
40	2471	2457	2443	2440	2436	2432	2428	2424	2421	2417
50	2457	2443	2429	2426	2422	2418	2414	2410	2407	2403
59 0	2443	2428	2415	2412	2408	2404	2400	2396	2393	2389
10	2429	2414	2401	2398	2394	2390	2386	2382	2379	2375
20	2415	2400	2387	2384	2380	2376	2372	2368	2365	2361
30	2400	2386	2373	2370	2366	2362	2358	2354	2351	2347
40	2386	2372	2359	2356	2352	2348	2345	2341	2337	2334
50	2373	2358	2345	2342	2338	2334	2331	2327	2323	2320
60 0	2359	2345	2331	2328	2324	2320	2317	2313	2309	2306
10	2345	2331	2317	2314	2311	2307	2303	2299	2296	2292
20	2331	2317	2304	2301	2297	2293	2290	2286	2282	2279
30	2317	2303	2290	2287	2283	2279	2276	2272	2268	2265
40	2303	2290	2276	2273	2270	2266	2262	2258	2255	2251
50	2290	2276	2263	2260	2256	2252	2249	2245	2241	2238
61 0	2276	2262	2249	2246	2243	2239	2235	2231	2228	2224
10	2262	2249	2236	2233	2229	2225	2222	2218	2214	2211
20	2249	2235	2222	2219	2216	2212	2209	2205	2201	2198
30	2235	2222	2209	2206	2202	2198	2195	2191	2187	2184
40	2222	2208	2195	2192	2189	2185	2182	2178	2174	2171

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

Moon's Hor. Par. ′ ″	*Apparent altitude of Moon's centre.* 7° 24′	7° 27′	7° 30′	7° 33′	7° 36′	7° 39′	7° 42′	7° 45′	7° 48′	7° 51′
54 0	2826	2823	2819	2815	2810	2806	2802	2798	2795	2792
10	2811	2807	2803	2799	2795	2791	2787	2783	2780	2777
20	2796	2791	2787	2783	2780	2776	2772	2768	2765	2762
30	2780	2776	2772	2768	2765	2761	2757	2753	2750	2747
40	2765	2761	2757	2753	2749	2745	2741	2737	2734	2731
50	2750	2746	2742	2738	2734	2730	2726	2722	2719	2716
55 0	2735	2731	2727	2723	2719	2715	2711	2707	2704	2701
10	2719	2716	2712	2708	2704	2700	2696	2692	2689	2686
20	2704	2700	2696	2692	2689	2685	2681	2677	2674	2671
30	2689	2685	2681	2677	2674	2670	2666	2662	2659	2656
40	2674	2671	2667	2663	2659	2655	2651	2647	2644	2641
50	2659	2656	2652	2648	2644	2640	2637	2633	2630	2627
56 0	2645	2641	2637	2633	2630	2626	2622	2618	2615	2612
10	2630	2626	2622	2618	2615	2611	2607	2603	2600	2597
20	2615	2611	2607	2603	2600	2596	2592	2589	2586	2583
30	2600	2597	2593	2589	2586	2582	2578	2574	2571	2568
40	2586	2582	2578	2574	2571	2567	2563	2559	2556	2553
50	2571	2567	2563	2559	2556	2552	2548	2545	2542	2539
57 0	2556	2553	2549	2545	2542	2538	2534	2530	2527	2524
10	2542	2538	2534	2530	2527	2523	2519	2516	2513	2510
20	2527	2524	2520	2516	2513	2509	2505	2502	2499	2496
30	2513	2510	2506	2502	2499	2495	2491	2487	2484	2481
40	2499	2495	2491	2487	2484	2480	2476	2473	2470	2467
50	2484	2481	2477	2473	2470	2466	2462	2459	2456	2453
58 0	2470	2467	2463	2459	2456	2452	2448	2445	2442	2439
10	2456	2452	2448	2444	2441	2438	2434	2431	2428	2425
20	2441	2438	2434	2430	2427	2424	2420	2416	2413	2410
30	2427	2424	2420	2416	2413	2410	2406	2402	2399	2396
40	2413	2410	2406	2402	2399	2396	2392	2388	2385	2382
50	2399	2396	2392	2388	2385	2382	2378	2375	2372	2369
59 0	2385	2382	2378	2374	2371	2368	2364	2361	2358	2355
10	2371	2368	2364	2360	2357	2354	2350	2347	2344	2341
20	2357	2354	2350	2346	2343	2340	2336	2333	2330	2327
30	2343	2340	2336	2332	2329	2326	2322	2319	2316	2313
40	2330	2327	2323	2319	2316	2312	2308	2305	2302	2299
50	2316	2313	2309	2305	2302	2299	2295	2292	2289	2286
60 0	2302	2299	2295	2291	2288	2285	2281	2278	2275	2272
10	2289	2286	2282	2278	2275	2271	2268	2265	2262	2259
20	2275	2272	2268	2264	2261	2258	2254	2251	2248	2245
30	2261	2258	2254	2250	2247	2244	2240	2237	2234	2231
40	2248	2245	2241	2237	2234	2231	2227	2224	2221	2218
50	2234	2231	2227	2223	2220	2217	2214	2211	2208	2205
61 0	2221	2218	2214	2210	2207	2204	2200	2197	2194	2191
10	2207	2204	2200	2196	2193	2190	2187	2184	2181	2178
20	2194	2191	2187	2183	2180	2177	2174	2171	2168	2165
30	2181	2178	2174	2170	2167	2164	2160	2157	2154	2151
40	2167	2164	2160	2157	2154	2151	2147	2144	2141	2138

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

Moon's Hor. Par. ′	″	7° 54′	7° 57′	8° 00′	8° 3′	8° 6′	8° 9′	8° 12′	8° 15′	8° 18′	8° 21′
		Apparent altitude of Moon's centre.									
54	0	2789	2785	2781	2777	2774	2771	2768	2764	2761	2758
	10	2774	2770	2766	2762	2759	2756	2753	2749	2746	2743
	20	2759	2755	2751	2747	2744	2741	2738	2734	2731	2728
	30	2743	2739	2736	2732	2729	2726	2723	2719	2716	2713
	40	2727	2724	2721	2717	2714	2711	2708	2704	2701	2698
	50	2712	2709	2706	2702	2699	2696	2693	2689	2686	2683
55	0	2697	2694	2691	2687	2684	2681	2678	2675	2671	2668
	10	2682	2679	2676	2672	2669	2666	2663	2659	2656	2653
	20	2667	2664	2661	2657	2654	2651	2648	2644	2641	2638
	30	2652	2649	2646	2642	2639	2636	2633	2629	2626	2623
	40	2637	2634	2631	2627	2624	2621	2618	2615	2612	2609
	50	2623	2619	2616	2612	2609	2606	2603	2600	2597	2594
56	0	2608	2605	2602	2598	2595	2592	2589	2586	2582	2579
	10	2593	2590	2587	2583	2580	2577	2574	2571	2568	2565
	20	2579	2575	2572	2569	2566	2563	2560	2556	2553	2550
	30	2564	2561	2558	2554	2551	2548	2545	2542	2539	2536
	40	2549	2546	2543	2540	2537	2534	2531	2527	2524	2521
	50	2535	2532	2529	2525	2522	2519	2516	2513	2510	2507
57	0	2520	2517	2514	2511	2508	2505	2502	2499	2496	2493
	10	2506	2503	2500	2496	2493	2490	2487	2484	2481	2478
	20	2492	2489	2486	2482	2479	2476	2473	2470	2467	2464
	30	2477	2474	2471	2468	2465	2462	2459	2456	2453	2450
	40	2463	2460	2457	2454	2451	2448	2445	2442	2439	2436
	50	2449	2446	2443	2440	2437	2434	2431	2427	2424	2421
58	0	2435	2432	2429	2425	2422	2419	2416	2413	2410	2407
	10	2421	2418	2415	2411	2408	2405	2402	2399	2396	2393
	20	2407	2404	2401	2397	2394	2391	2388	2385	2382	2379
	30	2393	2390	2387	2383	2380	2377	2374	2371	2368	2365
	40	2379	2376	2373	2369	2366	2363	2360	2357	2355	2352
	50	2365	2362	2359	2356	2353	2350	2347	2344	2341	2338
59	0	2351	2348	2345	2342	2339	2336	2333	2330	2327	2324
	10	2337	2334	2331	2328	2325	2322	2319	2316	2313	2310
	20	2323	2320	2317	2314	2311	2308	2305	2302	2299	2296
	30	2310	2307	2304	2301	2298	2295	2292	2289	2286	2283
	40	2296	2293	2290	2287	2284	2281	2278	2275	2272	2269
	50	2282	2279	2276	2273	2270	2267	2264	2261	2259	2256
60	0	2269	2266	2263	2260	2257	2254	2251	2248	2245	2242
	10	2255	2252	2249	2246	2243	2240	2237	2234	2232	2229
	20	2242	2239	2236	2233	2230	2227	2224	2221	2218	2215
	30	2228	2225	2222	2219	2216	2213	2210	2207	2205	2202
	40	2215	2212	2209	2206	2203	2200	2197	2194	2191	2188
	50	2201	2198	2195	2192	2189	2186	2183	2180	2178	2175
61	0	2188	2185	2182	2179	2176	2173	2170	2167	2165	2162
	10	2175	2172	2169	2166	2163	2160	2157	2154	2151	2148
	20	2161	2158	2155	2152	2149	2147	2144	2141	2138	2135
	30	2148	2145	2142	2139	2136	2133	2130	2127	2125	2122
	40	2135	2132	2129	2126	2123	2120	2117	2114	2112	2109

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par. ′ ″	*Apparent altitude of Moon's centre.* 8° 24′	8° 27′	8° 30′	8° 33′	8° 36′	8° 39′	8° 42′	8° 45′	8° 48′	8° 51′
54 0	2755	2752	2749	2746	2743	2740	2737	2734	2731	2728
10	2740	2737	2734	2731	2728	2725	2722	2719	2716	2713
20	2725	2722	2719	2716	2713	2710	2707	2704	2701	2698
30	2710	2707	2704	2701	2698	2695	2692	2689	2686	2683
40	2695	2692	2689	2686	2683	2680	2677	2674	2671	2668
50	2680	2677	2674	2671	2668	2665	2662	2659	2656	2653
55 0	2665	2662	2659	2656	2653	2650	2647	2644	2641	2638
10	2650	2647	2644	2641	2638	2635	2632	2629	2627	2624
20	2635	2632	2629	2626	2623	2620	2617	2614	2612	2609
30	2620	2617	2614	2611	2609	2606	2603	2600	2597	2594
40	2606	2603	2600	2597	2594	2591	2588	2585	2583	2580
50	2591	2588	2585	2582	2579	2576	2573	2570	2568	2565
56 0	2576	2573	2570	2567	2564	2562	2559	2556	2553	2550
10	2562	2559	2556	2553	2550	2547	2544	2541	2539	2536
20	2547	2544	2541	2538	2535	2533	2530	2527	2524	2521
30	2533	2530	2527	2524	2521	2518	2515	2512	2510	2507
40	2518	2515	2512	2509	2506	2504	2501	2498	2496	2493
50	2504	2501	2498	2495	2492	2490	2487	2484	2481	2478
57 0	2490	2487	2484	2481	2478	2475	2472	2469	2467	2464
10	2475	2472	2469	2466	2463	2461	2458	2455	2453	2450
20	2461	2458	2455	2452	2449	2447	2444	2441	2439	2436
30	2447	2444	2441	2438	2435	2433	2430	2427	2425	2422
40	2433	2430	2427	2424	2421	2419	2416	2413	2411	2408
50	2418	2416	2413	2410	2407	2405	2402	2399	2397	2394
58 0	2404	2402	2399	2396	2393	2391	2388	2385	2383	2380
10	2390	2388	2385	2382	2379	2377	2374	2371	2369	2366
20	2376	2374	2371	2368	2365	2363	2360	2357	2355	2352
30	2362	2360	2357	2354	2351	2349	2346	2343	2341	2338
40	2349	2346	2343	2340	2337	2335	2332	2329	2327	2324
50	2335	2332	2329	2326	2323	2321	2318	2315	2313	2310
59 0	2321	2318	2315	2312	2309	2307	2304	2302	2300	2297
10	2307	2305	2302	2299	2296	2294	2291	2289	2286	2283
20	2293	2291	2288	2285	2282	2280	2277	2275	2272	2269
30	2280	2277	2274	2271	2268	2266	2263	2261	2259	2256
40	2266	2264	2261	2258	2255	2253	2250	2248	2245	2242
50	2253	2250	2247	2244	2241	2239	2236	2234	2232	2229
60 0	2239	2237	2234	2231	2228	2226	2223	2221	2218	2215
10	2226	2223	2220	2217	2214	2212	2209	2207	2205	2202
20	2212	2209	2207	2204	2201	2199	2196	2194	2191	2188
30	2199	2196	2193	2190	2188	2186	2183	2181	2178	2175
40	2185	2183	2180	2177	2175	2172	2169	2167	2165	2162
50	2172	2170	2167	2164	2162	2159	2156	2154	2152	2149
61 0	2159	2157	2154	2151	2149	2146	2143	2141	2138	2135
10	2145	2143	2140	2137	2135	2133	2130	2128	2125	2122
20	2132	2130	2127	2124	2122	2119	2116	2114	2112	2109
30	2119	2117	2114	2111	2109	2106	2103	2101	2099	2096
40	2106	2104	2101	2098	2096	2093	2090	2088	2086	2083

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	8° 54′	8° 57′	9° 0′	9° 3′	9° 6′	9° 9′	9° 12′	9° 15′	9° 18′	9° 21′
54 0	2725	2723	2720	2717	2714	2712	2709	2706	2703	2701
10	2710	2708	2705	2702	2699	2697	2694	2691	2688	2686
20	2695	2693	2690	2687	2685	2682	2679	2676	2673	2671
30	2680	2678	2675	2672	2670	2667	2664	2661	2658	2656
40	2665	2663	2660	2657	2655	2652	2649	2646	2643	2641
50	2650	2648	2645	2642	2640	2637	2634	2632	2629	2627
55 0	2635	2633	2630	2627	2625	2622	2619	2617	2614	2612
10	2621	2619	2616	2613	2611	2608	2605	2602	2599	2597
20	2606	2604	2601	2598	2596	2593	2590	2588	2585	2583
30	2591	2589	2586	2583	2581	2578	2575	2573	2570	2568
40	2577	2575	2572	2569	2566	2564	2561	2558	2555	2553
50	2562	2560	2557	2554	2551	2549	2546	2544	2541	2539
56 0	2547	2545	2542	2539	2537	2535	2532	2529	2526	2524
10	2533	2531	2528	2525	2523	2520	2517	2515	2512	2510
20	2519	2517	2514	2511	2509	2506	2503	2501	2498	2496
30	2504	2502	2499	2496	2494	2492	2489	2486	2483	2481
40	2490	2488	2485	2482	2480	2477	2474	2472	2469	2467
50	2476	2474	2471	2468	2466	2463	2460	2458	2455	2453
57 0	2461	2459	2456	2453	2451	2449	2446	2444	2441	2439
10	2447	2445	2442	2439	2437	2435	2432	2430	2427	2425
20	2433	2431	2428	2425	2423	2421	2418	2415	2413	2410
30	2419	2417	2414	2412	2409	2407	2404	2401	2399	2396
40	2405	2403	2400	2398	2395	2393	2390	2387	2385	2382
50	2391	2389	2386	2384	2381	2379	2376	2373	2371	2368
58 0	2377	2375	2372	2370	2367	2365	2362	2360	2357	2355
10	2363	2361	2358	2356	2353	2351	2348	2346	2343	2341
20	2349	2347	2344	2342	2339	2337	2334	2332	2329	2327
30	2335	2335	2330	2328	2325	2323	2320	2318	2315	2313
40	2322	2320	2317	2314	2312	2309	2306	2304	2301	2299
50	2308	2306	2303	2300	2298	2296	2293	2291	2288	2286
59 0	2294	2292	2289	2287	2284	2282	2279	2277	2274	2272
10	2281	2279	2276	2273	2270	2268	2265	2263	2260	2258
20	2267	2265	2262	2260	2257	2255	2252	2250	2247	2245
30	2253	2251	2248	2246	2243	2241	2238	2236	2233	2231
40	2240	2238	2235	2232	2230	2228	2225	2223	2220	2218
50	2226	2224	2221	2218	2216	2214	2211	2209	2207	2205
60 0	2213	2211	2208	2205	2203	2201	2198	2196	2193	2191
10	2200	2198	2195	2192	2190	2188	2185	2183	2180	2178
20	2186	2184	2181	2178	2176	2174	2171	2169	2166	2164
30	2173	2171	2168	2165	2163	2161	2158	2156	2153	2151
40	2160	2158	2155	2152	2150	2148	2145	2143	2140	2138
50	2146	2144	2141	2138	2136	2134	2131	2129	2127	2125
61 0	2133	2131	2128	2125	2123	2121	2118	2116	2114	2112
10	2120	2118	2115	2112	2110	2108	2105	2103	2101	2099
20	2107	2105	2102	2099	2097	2095	2092	2090	2088	2086
30	2094	2092	2089	2086	2084	2082	2079	2077	2074	2072
40	2081	2079	2076	2073	2071	2069	2066	2064	2061	2059

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

Moon's Hor. Par. ′ ″	*Apparent altitude of Moon's centre.* 9° 24′	9° 27′	9° 30′	9° 34′	9° 38′	9° 42′	9° 46′	9° 50′	9° 54′	9° 58′
54 0	2699	2697	2694	2691	2688	2684	2681	2678	2675	2672
10	2684	2682	2679	2676	2673	2669	2666	2663	2660	2657
20	2669	2667	2664	2661	2658	2654	2651	2648	2645	2642
30	2654	2652	2649	2646	2643	2639	2636	2633	2630	2627
40	2639	2637	2634	2631	2628	2624	2621	2618	2615	2612
50	2625	2622	2619	2616	2613	2610	2607	2604	2601	2598
55 0	2610	2608	2605	2602	2599	2595	2592	2589	2586	2583
10	2595	2593	2590	2587	2584	2580	2577	2574	2571	2568
20	2581	2578	2575	2572	2569	2566	2563	2560	2557	2554
30	2566	2564	2561	2558	2555	2551	2548	2545	2542	2539
40	2551	2549	2546	2543	2540	2537	2534	2531	2528	2525
50	2537	2535	2532	2529	2526	2523	2520	2517	2514	2511
56 0	2522	2520	2517	2514	2511	2508	2505	2502	2499	2496
10	2508	2506	2503	2500	2497	2494	2491	2488	2485	2482
20	2494	2492	2489	2486	2483	2480	2477	2474	2471	2468
30	2479	2477	2474	2471	2468	2465	2462	2459	2456	2453
40	2465	2463	2460	2457	2454	2451	2448	2445	2442	2439
50	2451	2449	2446	2443	2440	2437	2434	2431	2428	2425
57 0	2437	2434	2432	2429	2426	2423	2420	2417	2414	2411
10	2423	2420	2418	2415	2412	2409	2406	2403	2400	2397
20	2408	2406	2404	2401	2398	2395	2392	2389	2386	2383
30	2394	2392	2390	2387	2384	2381	2378	2375	2372	2369
40	2380	2378	2376	2373	2370	2367	2364	2361	2358	2355
50	2366	2364	2362	2359	2356	2353	2350	2347	2344	2341
58 0	2353	2351	2348	2345	2342	2339	2336	2333	2330	2327
10	2339	2337	2334	2331	2328	2325	2322	2319	2316	2313
20	2325	2323	2320	2317	2314	2311	2308	2306	2303	2300
30	2311	2309	2306	2303	2300	2297	2294	2292	2289	2286
40	2297	2295	2293	2290	2287	2284	2281	2278	2275	2272
50	2284	2282	2279	2276	2273	2270	2267	2265	2262	2259
59 0	2270	2268	2265	2262	2259	2257	2254	2251	2248	2245
10	2256	2254	2252	2249	2246	2243	2240	2238	2235	2232
20	2243	2241	2238	2235	2233	2230	2227	2224	2221	2218
30	2229	2227	2225	2222	2219	2216	2213	2211	2208	2205
40	2216	2214	2211	2208	2206	2203	2200	2197	2194	2191
50	2203	2201	2198	2195	2192	2189	2186	2184	2181	2178
60 0	2189	2187	2185	2182	2179	2176	2173	2171	2168	2165
10	2176	2174	2171	2168	2166	2163	2160	2158	2155	2152
20	2162	2160	2158	2155	2152	2149	2146	2144	2141	2138
30	2149	2147	2145	2142	2139	2136	2133	2131	2128	2125
40	2136	2134	2132	2129	2126	2123	2120	2118	2115	2112
50	2123	2121	2118	2115	2113	2110	2107	2105	2102	2099
61 0	2110	2108	2105	2102	2100	2097	2094	2092	2089	2086
10	2097	2095	2092	2089	2087	2084	2081	2079	2076	2073
20	2084	2082	2079	2076	2074	2071	2068	2066	2063	2060
30	2070	2068	2066	2063	2061	2058	2055	2053	2050	2047
40	2057	2055	2053	2050	2048	2045	2042	2040	2037	2034

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.		Apparent altitude of Moon's centre.									
′	″	° ′ 10 2	° ′ 10 6	° ′ 10 10	° ′ 10 14	° ′ 10 18	° ′ 10 22	° ′ 10 26	° ′ 10 30	° ′ 10 34	° ′ 10 38
54	0	2668	2665	2662	2659	2656	2653	2651	2649	2646	2643
	10	2654	2651	2648	2645	2642	2639	2637	2634	2631	2628
	20	2640	2637	2634	2631	2628	2625	2622	2619	2616	2613
	30	2625	2622	2619	2616	2613	2610	2608	2605	2602	2599
	40	2610	2607	2604	2601	2598	2595	2593	2590	2587	2584
	50	2595	2592	2589	2587	2584	2581	2578	2575	2572	2570
55	0	2581	2578	2575	2572	2569	2566	2564	2561	2558	2555
	10	2566	2563	2560	2557	2554	2551	2549	2546	2543	2540
	20	2552	2549	2546	2543	2540	2537	2535	2532	2529	2526
	30	2537	2534	2531	2528	2525	2522	2520	2517	2514	2512
	40	2523	2520	2517	2514	2511	2508	2506	2503	2500	2497
	50	2508	2505	2502	2500	2497	2494	2492	2489	2486	2483
56	0	2494	2491	2488	2485	2482	2479	2477	2474	2471	2469
	10	2480	2477	2474	2471	2468	2465	2463	2460	2457	2455
	20	2465	2462	2459	2457	2454	2451	2449	2446	2443	2440
	30	2451	2448	2445	2443	2440	2437	2435	2432	2429	2426
	40	2437	2434	2431	2428	2425	2423	2420	2418	2415	2412
	50	2423	2420	2417	2414	2411	2409	2406	2404	2401	2398
57	0	2409	2406	2403	2400	2397	2395	2392	2390	2387	2384
	10	2395	2392	2389	2386	2383	2381	2378	2376	2373	2370
	20	2381	2378	2375	2372	2369	2367	2364	2362	2359	2356
	30	2367	2364	2361	2358	2355	2353	2350	2348	2345	2342
	40	2353	2350	2347	2345	2342	2339	2337	2334	2331	2329
	50	2339	2336	2333	2331	2328	2325	2323	2320	2317	2315
58	0	2325	2322	2319	2317	2314	2311	2309	2306	2303	2301
	10	2311	2308	2306	2303	2300	2298	2295	2293	2290	2288
	20	2298	2295	2292	2290	2287	2284	2282	2279	2276	2274
	30	2284	2281	2278	2276	2273	2270	2268	2265	2262	2260
	40	2270	2267	2264	2262	2259	2257	2254	2252	2249	2247
	50	2257	2254	2251	2249	2246	2243	2241	2238	2235	2233
59	0	2243	2240	2237	2235	2232	2230	2227	2225	2222	2220
	10	2230	2227	2224	2222	2219	2216	2214	2211	2208	2206
	20	2216	2213	2210	2208	2205	2203	2200	2198	2195	2193
	30	2203	2200	2197	2195	2192	2190	2187	2185	2182	2180
	40	2189	2186	2184	2182	2179	2176	2174	2171	2168	2166
	50	2176	2173	2170	2168	2165	2163	2160	2158	2155	2153
60	0	2163	2160	2157	2155	2152	2150	2147	2145	2142	2140
	10	2150	2147	2144	2142	2139	2137	2134	2132	2129	2127
	20	2136	2133	2131	2129	2126	2123	2121	2118	2115	2113
	30	2123	2120	2117	2115	2112	2110	2107	2105	2102	2100
	40	2110	2107	2104	2102	2099	2097	2094	2092	2089	2087
	50	2097	2094	2091	2089	2086	2084	2081	2079	2076	2074
61	0	2084	2081	2078	2076	2073	2071	2068	2066	2063	2061
	10	2071	2068	2065	2063	2060	2058	2055	2053	2050	2048
	20	2058	2055	2052	2050	2047	2045	2042	2040	2037	2035
	30	2045	2042	2039	2037	2034	2032	2029	2027	2024	2022
	40	2032	2029	2027	2025	2022	2020	2017	2015	2012	2009

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

TABLE I.—LOGARITHMS.

Moon's Hor. Par.		Apparent altitude of Moon's centre.									
′	″	° ′ 10 42	° ′ 10 46	° ′ 10 50	° ′ 10 54	° ′ 10 58	° ′ 11 2	° ′ 11 6	° ′ 11 10	° ′ 11 15	° ′ 11 20
54	0	2641	2638	2636	2633	2631	2629	2626	2624	2621	2618
	10	2626	2623	2621	2618	2616	2614	2611	2609	2606	2603
	20	2611	2608	2606	2603	2601	2599	2597	2594	2591	2588
	30	2597	2594	2591	2588	2586	2584	2582	2579	2576	2573
	40	2582	2579	2577	2574	2572	2570	2567	2565	2562	2559
	50	2568	2565	2562	2560	2557	2555	2552	2550	2547	2544
55	0	2553	2550	2548	2545	2543	2541	2538	2536	2533	2530
	10	2538	2535	2533	2530	2528	2526	2523	2521	2518	2515
	20	2524	2521	2519	2516	2514	2512	2509	2507	2504	2501
	30	2510	2507	2504	2502	2499	2497	2495	2493	2490	2487
	40	2495	2492	2490	2487	2485	2483	2480	2478	2475	2472
	50	2481	2478	2476	2473	2471	2469	2466	2464	2461	2458
56	0	2467	2464	2462	2459	2457	2455	2452	2450	2447	2444
	10	2453	2450	2447	2445	2442	2440	2438	2436	2433	2430
	20	2438	2435	2433	2430	2428	2426	2424	2422	2419	2416
	30	2424	2421	2419	2416	2414	2412	2410	2408	2405	2402
	40	2410	2407	2405	2402	2400	2398	2396	2394	2391	2388
	50	2396	2393	2391	2388	2386	2384	2382	2380	2377	2374
57	0	2382	2379	2377	2374	2372	2370	2368	2366	2363	2360
	10	2368	2365	2363	2360	2358	2356	2354	2352	2349	2346
	20	2354	2351	2349	2346	2344	2342	2340	2338	2335	2332
	30	2340	2337	2335	2333	2331	2329	2326	2324	2321	2318
	40	2327	2324	2322	2319	2317	2315	2312	2310	2307	2304
	50	2313	2310	2308	2305	2303	2301	2299	2297	2294	2291
58	0	2299	2296	2294	2291	2289	2287	2285	2283	2280	2277
	10	2286	2283	2281	2278	2276	2274	2271	2269	2266	2263
	20	2272	2269	2267	2264	2262	2260	2258	2256	2253	2250
	30	2258	2255	2253	2251	2249	2247	2244	2242	2239	2236
	40	2245	2242	2240	2237	2235	2233	2231	2229	2226	2223
	50	2231	2228	2226	2224	2222	2220	2217	2215	2212	2209
59	0	2218	2215	2213	2210	2208	2206	2204	2202	2199	2196
	10	2204	2201	2199	2197	2195	2193	2191	2189	2186	2183
	20	2191	2188	2186	2183	2181	2179	2177	2175	2172	2169
	30	2178	2175	2173	2170	2168	2166	2164	2162	2159	2156
	40	2164	2161	2159	2157	2155	2153	2151	2149	2146	2143
	50	2151	2148	2146	2144	2142	2140	2138	2136	2133	2130
60	0	2138	2135	2133	2130	2128	2126	2124	2122	2119	2117
	10	2125	2122	2120	2117	2115	2113	2111	2109	2106	2104
	20	2111	2109	2107	2104	2102	2100	2098	2096	2093	2091
	30	2098	2096	2094	2091	2089	2087	2085	2083	2080	2078
	40	2085	2083	2081	2078	2076	2074	2072	2070	2067	2065
	50	2072	2070	2068	2065	2063	2061	2059	2057	2054	2052
61	0	2059	2057	2055	2052	2050	2048	2046	2044	2041	2039
	10	2046	2044	2042	2039	2037	2035	2033	2031	2028	2026
	20	2033	2031	2029	2026	2024	2022	2020	2018	2015	2013
	30	2020	2018	2016	2014	2012	2010	2008	2006	2003	2000
	40	2007	2005	2003	2001	1999	1997	1995	1993	1990	1987

TABLE A.

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Correction fo seconds of pa rallax.—Sub tract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

TABLE I.—LOGARITHMS.

Hor. Par.		Apparent altitude of Moon's centre.									
	″	° ′ 11 25	° ′ 11 30	° ′ 11 35	° ′ 11 40	° ′ 11 45	° ′ 11 50	° ′ 11 55	° ′ 12 00	° ′ 12 5	° ′ 12 10
	0	2615	2612	2609	2607	2604	2601	2599	2596	2593	2591
	10	2600	2597	2594	2592	2589	2586	2584	2581	2578	2576
	20	2585	2582	2579	2577	2574	2571	2569	2566	2564	2561
	30	2571	2568	2565	2563	2560	2557	2555	2552	2549	2547
	40	2556	2553	2550	2548	2545	2542	2540	2537	2534	2532
	50	2542	2539	2536	2534	2531	2528	2526	2523	2520	2518
55	0	2527	2524	2521	2519	2516	2513	2511	2508	2506	2503
	10	2513	2510	2507	2505	2502	2499	2497	2494	2491	2489
	20	2498	2495	2492	2490	2487	2485	2482	2480	2477	2475
	30	2484	2481	2478	2476	2473	2470	2468	2465	2463	2461
	40	2470	2467	2464	2462	2459	2456	2454	2451	2449	2447
	50	2456	2453	2450	2448	2445	2442	2440	2437	2435	2433
56	0	2442	2439	2436	2434	2431	2428	2426	2423	2421	2419
	10	2427	2424	2421	2419	2416	2414	2411	2409	2407	2405
	20	2413	2410	2407	2405	2402	2400	2397	2395	2393	2391
	30	2399	2396	2393	2391	2388	2386	2383	2381	2379	2377
	40	2385	2382	2379	2377	2374	2372	2369	2367	2365	2363
	50	2371	2368	2365	2363	2360	2358	2355	2353	2351	2349
57	0	2357	2354	2352	2349	2347	2344	2342	2339	2337	2335
	10	2344	2341	2338	2336	2333	2330	2328	2325	2323	2321
	20	2330	2327	2324	2322	2319	2317	2314	2312	2310	2307
	30	2316	2313	2310	2308	2305	2303	2300	2298	2296	2294
	40	2302	2299	2297	2294	2292	2289	2287	2284	2282	2280
	50	2289	2286	2283	2281	2278	2276	2273	2271	2269	2266
58	0	2275	2272	2269	2267	2264	2262	2259	2257	2255	2252
	10	2261	2258	2256	2253	2251	2248	2246	2243	2241	2238
	20	2248	2245	2242	2240	2237	2235	2232	2230	2228	2225
	30	2234	2231	2229	2226	2224	2221	2219	2216	2214	2211
	40	2221	2218	2215	2213	2210	2208	2205	2203	2201	2198
	50	2207	2204	2202	2199	2197	2195	2192	2190	2188	2185
59	0	2194	2191	2189	2186	2184	2181	2179	2176	2174	2171
	10	2181	2178	2175	2173	2170	2168	2165	2163	2161	2158
	20	2167	2164	2162	2159	2157	2155	2152	2150	2148	2145
	30	2154	2151	2149	2146	2144	2141	2139	2136	2134	2132
	40	2141	2138	2135	2133	2130	2128	2125	2123	2121	2118
	50	2128	2125	2122	2120	2117	2115	2112	2110	2108	2105
60	0	2114	2112	2109	2107	2104	2102	2099	2097	2095	2092
	10	2101	2099	2096	2094	2091	2089	2086	2084	2082	2079
	20	2088	2086	2083	2081	2078	2076	2073	2071	2069	2066
	30	2075	2073	2070	2068	2065	2063	2060	2058	2056	2053
	40	2062	2060	2057	2055	2052	2050	2047	2045	2043	2040
	50	2049	2047	2044	2042	2039	2037	2034	2032	2030	2027
61	0	2036	2034	2031	2029	2026	2024	2021	2019	2017	2015
	10	2023	2021	2018	2016	2013	2011	2008	2006	2004	2002
	20	2010	2008	2006	2003	2001	1999	1996	1994	1992	1989
	30	1998	1995	1993	1990	1988	1986	1983	1981	1979	1976
	40	1985	1982	1980	1977	1975	1973	1970	1968	1966	1964

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.		Apparent altitude of Moon's centre.									
′	″	° ′ 12 15	° ′ 12 20	° ′ 12 25	° ′ 12 30	° ′ 12 35	° ′ 12 40	° ′ 12 45	° ′ 12 50	° ′ 12 55	° ′ 13 00
54	0	2588	2586	2582	2580	2578	2575	2573	2571	2568	2566
	10	2573	2571	2568	2566	2564	2561	2559	2557	2554	2552
	20	2559	2556	2554	2551	2549	2546	2544	2542	2540	2538
	30	2544	2542	2539	2537	2535	2532	2530	2528	2525	2523
	40	2529	2527	2524	2522	2520	2517	2515	2513	2511	2509
	50	2515	2513	2510	2508	2506	2503	2501	2499	2496	2494
55	0	2501	2499	2496	2494	2492	2489	2487	2485	2482	2480
	10	2486	2484	2481	2479	2477	2474	2472	2470	2468	2466
	20	2472	2470	2467	2465	2463	2460	2458	2456	2454	2452
	30	2458	2456	2453	2451	2449	2446	2444	2442	2439	2437
	40	2444	2442	2439	2437	2435	2432	2430	2428	2425	2423
	50	2430	2428	2425	2423	2421	2418	2416	2414	2411	2409
56	0	2416	2414	2411	2409	2407	2404	2402	2400	2397	2395
	10	2402	2400	2397	2395	2393	2390	2388	2386	2383	2381
	20	2388	2386	2383	2381	2379	2376	2374	2372	2369	2367
	30	2374	2372	2369	2367	2365	2362	2360	2358	2355	2353
	40	2360	2358	2355	2353	2351	2348	2346	2344	2341	2339
	50	2346	2344	2341	2339	2337	2334	2332	2330	2328	2326
57	0	2332	2330	2327	2325	2323	2320	2318	2316	2314	2312
	10	2318	2316	2313	2311	2309	2307	2305	2303	2300	2298
	20	2304	2302	2300	2298	2296	2293	2291	2289	2287	2285
	30	2291	2289	2286	2284	2282	2279	2277	2275	2273	2271
	40	2277	2275	2272	2270	2268	2266	2264	2262	2259	2257
	50	2263	2261	2259	2257	2255	2252	2250	2248	2246	2244
58	0	2250	2248	2245	2243	2241	2239	2237	2235	2232	2230
	10	2236	2234	2232	2230	2228	2225	2223	2221	2219	2217
	20	2223	2221	2218	2216	2214	2212	2210	2208	2205	2203
	30	2209	2207	2205	2203	2201	2198	2196	2194	2192	2190
	40	2196	2194	2191	2189	2187	2185	2183	2181	2179	2177
	50	2183	2181	2178	2176	2174	2172	2170	2168	2165	2163
59	0	2169	2167	2165	2163	2161	2158	2156	2154	2152	2150
	10	2156	2154	2151	2149	2147	2145	2143	2141	2139	2137
	20	2143	2141	2138	2136	2134	2132	2130	2128	2126	2124
	30	2130	2128	2125	2123	2121	2119	2117	2115	2113	2111
	40	2116	2114	2112	2110	2108	2106	2104	2102	2100	2098
	50	2103	2101	2099	2097	2095	2092	2090	2088	2086	2085
60	0	2090	2088	2086	2084	2082	2079	2077	2075	2073	2072
	10	2077	2075	2073	2071	2069	2066	2064	2062	2060	2059
	20	2064	2062	2060	2058	2056	2054	2052	2050	2048	2046
	30	2051	2049	2047	2045	2043	2041	2039	2037	2035	2033
	40	2038	2036	2034	2032	2030	2028	2026	2024	2022	2020
	50	2025	2023	2021	2019	2017	2015	2013	2011	2009	2007
61	0	2013	2011	2008	2006	2004	2002	2000	1998	1996	1994
	10	2000	1998	1995	1993	1991	1989	1987	1985	1983	1981
	20	1987	1985	1983	1981	1979	1977	1975	1973	1970	1969
	30	1974	1972	1970	1968	1966	1964	1962	1960	1958	1956
	40	1962	1960	1957	1955	1953	1951	1949	1947	1945	1943

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Apparent altitude of Moon's centre.

Moon's Hor. Par. ′ ″	° ′ 13 5	° ′ 13 10	° ′ 13 15	° ′ 13 20	° ′ 13 25	° ′ 13 30	° ′ 13 35	° ′ 13 40	° ′ 13 45	° ′ 13 50
54 0	2564	2562	2559	2557	2555	2553	2551	2549	2547	2545
10	2550	2548	2545	2543	2541	2539	2537	2535	2533	2531
20	2536	2534	2531	2529	2527	2525	2523	2521	2519	2517
30	2521	2519	2517	2515	2513	2511	2509	2507	2505	2503
40	2507	2505	2502	2500	2498	2496	2494	2492	2490	2488
50	2492	2490	2488	2486	2484	2482	2480	2478	2476	2474
55 0	2478	2476	2474	2472	2470	2468	2466	2464	2462	2460
10	2464	2462	2460	2458	2456	2454	2452	2450	2448	2446
20	2450	2448	2446	2444	2442	2440	2438	2436	2434	2432
30	2435	2433	2431	2429	2427	2425	2423	2421	2419	2417
40	2421	2419	2417	2415	2413	2411	2409	2407	2405	2403
50	2407	2405	2403	2401	2399	2397	2395	2393	2391	2389
56 0	2393	2391	2389	2387	2385	2383	2381	2379	2377	2375
10	2379	2377	2375	2373	2371	2369	2367	2365	2364	2362
20	2365	2363	2361	2359	2357	2355	2353	2351	2350	2348
30	2351	2349	2347	2345	2343	2341	2339	2337	2336	2334
40	2337	2335	2333	2331	2329	2327	2325	2323	2322	2320
50	2324	2322	2320	2318	2316	2314	2312	2310	2308	2306
57 0	2310	2308	2306	2304	2302	2300	2298	2296	2295	2293
10	2296	2294	2292	2290	2288	2286	2284	2282	2281	2279
20	2283	2281	2279	2277	2275	2273	2271	2269	2267	2265
30	2269	2267	2265	2263	2261	2259	2257	2255	2254	2252
40	2255	2253	2251	2249	2247	2245	2243	2241	2240	2238
50	2242	2240	2238	2236	2234	2232	2230	2228	2227	2225
58 0	2228	2226	2224	2222	2220	2218	2216	2214	2213	2211
10	2215	2213	2211	2209	2207	2205	2203	2201	2200	2198
20	2201	2199	2198	2196	2194	2192	2190	2188	2187	2185
30	2188	2186	2184	2182	2180	2178	2176	2174	2173	2171
40	2175	2173	2171	2169	2167	2165	2163	2161	2160	2158
50	2161	2159	2158	2156	2154	2152	2150	2148	2147	2145
59 0	2148	2146	2145	2143	2141	2139	2137	2135	2134	2132
10	2135	2133	2131	2129	2127	2125	2123	2122	2120	2118
20	2122	2120	2118	2116	2114	2112	2110	2108	2107	2105
30	2109	2107	2105	2103	2101	2099	2097	2095	2094	2092
40	2096	2094	2092	2090	2088	2086	2084	2082	2081	2079
50	2083	2081	2079	2077	2075	2073	2071	2069	2068	2066
60 0	2070	2068	2066	2064	2062	2060	2058	2056	2055	2053
10	2057	2055	2053	2051	2049	2047	2045	2043	2042	2040
20	2044	2042	2040	2038	2036	2034	2032	2031	2029	2027
30	2031	2029	2027	2025	2023	2021	2019	2018	2016	2014
40	2018	2016	2014	2012	2010	2008	2006	2005	2003	2001
50	2005	2003	2002	2000	1998	1996	1994	1992	1990	1989
61 0	1992	1990	1989	1987	1985	1983	1981	1979	1977	1976
10	1979	1977	1976	1974	1972	1970	1968	1967	1965	1963
20	1967	1965	1963	1961	1959	1957	1955	1954	1952	1950
30	1954	1952	1951	1949	1947	1945	1943	1942	1940	1938
40	1941	1939	1938	1936	1934	1932	1930	1929	1927	1925

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	° ′ 13 55	° ′ 14 00	° ′ 14 5	° ′ 14 10	° ′ 14 15	° ′ 14 20	° ′ 14 25	° ′ 14 30	° ′ 14 35	° ′ 14 40
54 0	2543	2541	2539	2537	2535	2534	2532	2530	2528	2527
10	2529	2527	2525	2523	2521	2520	2518	2516	2514	2513
20	2515	2513	2511	2509	2507	2506	2504	2502	2500	2499
30	2501	2499	2497	2495	2493	2492	2490	2488	2486	2485
40	2486	2484	2482	2480	2478	2477	2475	2473	2471	2470
50	2472	2470	2468	2466	2464	2463	2461	2459	2457	2456
55 0	2458	2456	2454	2452	2450	2449	2447	2445	2443	2442
10	2444	2442	2440	2438	2436	2435	2433	2431	2429	2428
20	2430	2428	2426	2424	2422	2421	2419	2417	2415	2414
30	2415	2413	2412	2410	2408	2406	2405	2403	2401	2400
40	2401	2399	2398	2396	2394	2392	2391	2389	2387	2386
50	2387	2385	2384	2382	2380	2378	2377	2375	2373	2372
56 0	2373	2371	2370	2368	2366	2364	2363	2361	2359	2358
10	2360	2358	2356	2354	2352	2351	2349	2347	2345	2344
20	2346	2344	2342	2340	2338	2337	2335	2333	2331	2350
30	2332	2330	2328	2326	2324	2323	2321	2319	2317	2316
40	2318	2316	2314	2313	2311	2309	2308	2306	2304	2303
50	2304	2302	2300	2299	2297	2295	2294	2292	2290	2289
57 0	2291	2289	2287	2285	2283	2282	2280	2278	2276	2275
10	2277	2275	2273	2272	2270	2268	2267	2265	2263	2262
20	2263	2261	2259	2258	2256	2254	2253	2251	2249	2248
30	2250	2248	2246	2245	2243	2241	2240	2238	2236	2235
40	2236	2234	2232	2231	2229	2227	2226	2224	2222	2221
50	2223	2221	2219	2218	2216	2214	2213	2211	2209	2208
58 0	2209	2207	2205	2204	2202	2200	2199	2197	2195	2194
10	2196	2194	2192	2191	2189	2187	2186	2184	2182	2181
20	2183	2181	2179	2178	2176	2174	2173	2171	2169	2168
30	2169	2167	2165	2164	2162	2160	2159	2157	2155	2154
40	2156	2154	2152	2151	2149	2147	2146	2144	2142	2141
50	2143	2141	2139	2138	2136	2134	2133	2131	2129	2128
59 0	2130	2128	2126	2125	2123	2121	2120	2118	2116	2115
10	2117	2115	2113	2112	2110	2108	2107	2105	2103	2102
20	2103	2101	2099	2098	2096	2094	2093	2091	2089	2088
30	2090	2088	2086	2085	2085	2081	2080	2078	2076	2075
40	2077	2075	2073	2072	2070	2068	2067	2065	2063	2062
50	2064	2062	2060	2059	2057	2055	2054	2052	2050	2049
60 0	2051	2049	2047	2046	2045	2043	2042	2040	2038	2037
10	2038	2036	2034	2033	2032	2030	2029	2027	2025	2024
20	2026	2024	2022	2021	2019	2017	2016	2014	2012	2011
30	2013	2011	2009	2008	2006	2004	2003	2001	1999	1998
40	2000	1998	1996	1995	1993	1991	1990	1988	1986	1985
50	1987	1985	1983	1982	1980	1978	1977	1975	1973	1972
61 0	1974	1972	1970	1969	1968	1966	1965	1963	1961	1960
10	1962	1960	1958	1957	1955	1953	1952	1950	1948	1947
20	1949	1947	1945	1944	1942	1940	1959	1937	1935	1934
30	1937	1935	1933	1932	1930	1928	1927	1925	1923	1922
40	1924	1922	1920	1919	1917	1915	1914	1912	1910	1909

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.	*Apparent altitude of Moon's centre.*									
′ ″	° ′ 14 45	° ′ 14 50	° ′ 14 55	° ′ 15 00	° ′ 15 10	° ′ 15 20	° ′ 15 30	° ′ 15 40	° ′ 15 50	° ′ 16 00
54 0	2525	2523	2522	2520	2517	2514	2511	2508	2505	2502
10	2511	2509	2508	2506	2503	2500	2497	2494	2491	2488
20	2497	2495	2494	2492	2488	2485	2482	2479	2476	2473
30	2483	2481	2480	2478	2474	2471	2468	2465	2462	2459
40	2468	2466	2465	2463	2460	2457	2454	2451	2448	2445
50	2454	2452	2451	2449	2446	2443	2440	2437	2434	2431
55 0	2440	2438	2437	2435	2432	2429	2426	2423	2420	2417
10	2426	2424	2423	2421	2418	2415	2412	2409	2406	2403
20	2412	2410	2409	2407	2404	2401	2398	2395	2392	2389
30	2398	2396	2395	2393	2390	2387	2384	2381	2378	2375
40	2384	2382	2381	2379	2376	2373	2370	2367	2364	2361
50	2370	2368	2367	2365	2362	2359	2356	2353	2350	2347
56 0	2356	2354	2353	2351	2348	2345	2342	2339	2336	2333
10	2342	2340	2339	2337	2334	2331	2328	2325	2322	2319
20	2328	2326	2325	2323	2320	2317	2314	2311	2308	2305
30	2315	2313	2312	2310	2307	2304	2301	2298	2295	2292
40	2301	2299	2298	2296	2293	2290	2287	2284	2281	2278
50	2287	2285	2284	2282	2279	2276	2273	2270	2267	2264
57 0	2274	2272	2271	2269	2265	2262	2259	2257	2254	2251
10	2260	2258	2257	2255	2252	2249	2246	2243	2240	2237
20	2246	2244	2243	2241	2238	2235	2232	2230	2227	2224
30	2233	2231	2230	2228	2225	2222	2219	2216	2213	2210
40	2219	2217	2216	2214	2211	2208	2205	2203	2200	2197
50	2206	2204	2203	2201	2198	2195	2192	2190	2187	2184
58 0	21[illegible]	2191	2190	2188	2185	2182	2179	2176	2173	2170
10	2179	2177	2176	2174	2171	2168	2165	2163	2160	2157
20	2166	2164	2163	2161	2158	2155	2152	2150	2147	2144
30	2153	2151	2150	2148	2145	2142	2139	2137	2134	2131
40	2140	2138	2137	2135	2132	2129	2126	2123	2120	2117
50	2126	2124	2123	2121	2119	2116	2113	2110	2107	2104
59 0	2113	2111	2110	2108	2106	2103	2100	2097	2094	2091
10	2100	2098	2097	2095	2092	2089	2086	2084	2081	2078
20	2087	2085	2084	2082	2079	2076	2073	2071	2068	2065
30	2074	2072	2071	2069	2066	2063	2060	2058	2055	2052
40	2061	2059	2058	2056	2053	2050	2047	2045	2042	2039
50	2048	2046	2045	2043	2041	2038	2035	2032	2029	2026
60 0	2035	2033	2032	2030	2028	2025	2022	2020	2017	2014
10	2022	2020	2019	2017	2015	2012	2009	2007	2004	2001
20	2010	2008	2007	2005	2002	1999	1996	1994	1991	1988
30	1997	1995	1994	1992	1989	1986	1983	1981	1978	1975
40	1984	1982	1981	1979	1977	1974	1971	1969	1966	1963
50	1971	1969	1968	1966	1964	1961	1958	1956	1953	1950
61 0	1959	1957	1956	1954	1951	1948	1945	1943	1940	1937
10	1946	1944	1943	1941	1939	1936	1933	1931	1928	1925
20	1933	1931	1930	1928	1926	1923	1920	1918	1915	1912
30	1921	1919	1918	1916	1914	1911	1908	1906	1903	1900
40	1908	1906	1905	1903	1901	1898	1895	1893	1890	1887

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	° ′ 16 10	° ′ 16 20	° ′ 16 30	° ′ 16 40	° ′ 16 50	° ′ 17 00	° ′ 17 10	° ′ 17 20	° ′ 17 30	° ′ 17 40
54 0	2500	2497	2494	2491	2488	2485	2483	2480	2478	2476
10	2485	2482	2479	2476	2474	2471	2469	2466	2464	2462
20	2471	2468	2465	2462	2460	2457	2454	2452	2449	2447
30	2457	2454	2451	2448	2446	2443	2440	2438	2435	2433
40	2442	2439	2436	2434	2431	2429	2426	2424	2421	2419
50	2428	2425	2422	2420	2417	2415	2412	2410	2407	2405
55 0	2414	2411	2408	2406	2403	2401	2398	2396	2393	2391
10	2400	2397	2394	2392	2389	2387	2384	2382	2379	2377
20	2386	2383	2380	2378	2375	2373	2370	2368	2365	2363
30	2372	2369	2366	2364	2361	2359	2356	2354	2351	2349
40	2358	2355	2352	2350	2347	2345	2342	2340	2337	2335
50	2344	2342	2339	2336	2334	2331	2329	2326	2324	2322
56 0	2330	2328	2325	2322	2320	2317	2315	2312	2310	2308
10	2316	2314	2311	2308	2306	2303	2301	2298	2296	2294
20	2302	2300	2297	2295	2292	2290	2287	2285	2282	2280
30	2289	2287	2284	2281	2279	2276	2274	2271	2269	2267
40	2275	2273	2270	2267	2265	2262	2260	2257	2255	2253
50	2261	2259	2256	2254	2251	2249	2247	2244	2242	2240
57 0	2248	2246	2243	2240	2238	2235	2233	2230	2228	2226
10	2234	2232	2229	2227	2224	2222	2220	2217	2215	2213
20	2221	2219	2216	2213	2211	2208	2206	2203	2201	2199
30	2207	2205	2203	2200	2198	2195	2193	2190	2188	2186
40	2194	2192	2189	2187	2184	2182	2180	2177	2175	2173
50	2181	2179	2176	2173	2171	2168	2166	2163	2161	2159
58 0	2167	2165	2162	2160	2157	2155	2153	2150	2148	2146
10	2154	2152	2149	2147	2144	2142	2140	2137	2135	2133
20	2141	2139	2136	2134	2131	2129	2127	2124	2122	2120
30	2128	2126	2123	2121	2118	2116	2114	2111	2109	2107
40	2114	2112	2110	2108	2105	2102	2100	2097	2095	2093
50	2101	2099	2097	2094	2092	2089	2087	2084	2082	2080
59 0	2088	2086	2084	2081	2079	2076	2074	2071	2069	2067
10	2075	2073	2071	2068	2066	2063	2061	2058	2056	2054
20	2062	2060	2058	2055	2053	2050	2048	2046	2044	2042
30	2049	2047	2045	2042	2040	2037	2035	2033	2031	2029
40	2036	2034	2032	2030	2027	2025	2023	2020	2018	2016
50	2023	2021	2019	2017	2014	2012	2010	2007	2005	2003
60 0	2011	2009	2006	2004	2001	1999	1997	1994	1992	1990
10	1998	1996	1993	1991	1988	1986	1984	1981	1979	1977
20	1985	1983	1981	1979	1976	1973	1971	1969	1967	1965
30	1972	1970	1968	1966	1963	1961	1959	1956	1954	1952
40	1960	1958	1955	1953	1950	1948	1946	1943	1941	1939
50	1947	1945	1942	1940	1937	1935	1933	1931	1929	1927
61 0	1934	1932	1930	1928	1925	1923	1921	1918	1916	1914
10	1922	1920	1917	1915	1912	1910	1908	1906	1904	1902
20	1909	1907	1905	1902	1900	1898	1896	1893	1891	1889
30	1897	1895	1892	1890	1887	1885	1883	1881	1879	1877
40	1885	1883	1880	1878	1875	1873	1871	1868	1866	1864

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	13

Moon's Hor. Par.	*Apparent altitude of Moon's centre.*										
′	″	° ′ 17 50	° ′ 18 00	° ′ 18 10	° ′ 18 20	° ′ 18 30	° ′ 18 40	° ′ 18 50	° ′ 19 00	° ′ 19 10	° ′ 19 20
54	0	2473	2471	2469	2466	2464	2462	2460	2459	2457	2455
	10	2459	2457	2455	2452	2450	2448	2446	2445	2443	2441
	20	2444	2442	2440	2438	2436	2434	2431	2430	2428	2427
	30	2430	2428	2426	2424	2422	2420	2417	2416	2414	2412
	40	2416	2414	2412	2410	2408	2406	2403	2402	2400	2398
	50	2402	2400	2398	2396	2394	2392	2389	2388	2386	2384
55	0	2388	2386	2384	2382	2380	2378	2375	2374	2372	2370
	10	2374	2372	2370	2368	2366	2364	2361	2360	2358	2357
	20	2360	2358	2356	2354	2352	2350	2348	2347	2345	2343
	30	2346	2344	2342	2340	2338	2336	2334	2333	2331	2329
	40	2333	2331	2329	2326	2324	2322	2320	2319	2317	2315
	50	2319	2317	2315	2312	2310	2308	2306	2305	2303	2301
56	0	2305	2303	2301	2299	2297	2295	2293	2292	2290	2288
	10	2291	2289	2287	2285	2283	2281	2279	2278	2276	2274
	20	2278	2276	2274	2271	2269	2267	2265	2264	2262	2261
	30	2264	2262	2260	2258	2256	2254	2252	2251	2249	2247
	40	2250	2248	2246	2244	2242	2240	2238	2237	2235	2233
	50	2237	2235	2233	2231	2229	2227	2225	2224	2222	2220
57	0	2223	2221	2219	2217	2215	2213	2211	2210	2208	2207
	10	2210	2208	2206	2204	2202	2200	2198	2197	2195	2193
	20	2197	2195	2193	2190	2188	2186	2185	2184	2182	2180
	30	2183	2181	2179	2177	2175	2173	2171	2170	2168	2167
	40	2170	2168	2166	2164	2162	2160	2158	2157	2155	2153
	50	2157	2155	2153	2151	2149	2147	2145	2144	2142	2140
58	0	2143	2141	2139	2137	2135	2133	2131	2130	2128	2127
	10	2130	2128	2126	2124	2122	2120	2118	2117	2115	2114
	20	2117	2115	2113	2111	2109	2107	2105	2104	2102	2101
	30	2104	2102	2100	2098	2096	2094	2092	2091	2089	2088
	40	2091	2089	2087	2085	2083	2081	2079	2078	2076	2075
	50	2078	2076	2074	2072	2070	2068	2066	2065	2063	2062
59	0	2065	2063	2061	2059	2057	2055	2053	2052	2050	2049
	10	2052	2050	2048	2046	2044	2042	2040	2039	2037	2036
	20	2039	2037	2035	2033	2031	2029	2027	2026	2024	2023
	30	2026	2024	2022	2020	2018	2016	2015	2014	2012	2010
	40	2013	2011	2009	2007	2005	2003	2002	2001	1999	1997
	50	2001	1999	1997	1995	1993	1991	1989	1988	1986	1985
60	0	1988	1986	1984	1982	1980	1978	1976	1975	1973	1972
	10	1975	1973	1971	1969	1967	1965	1964	1963	1961	1959
	20	1962	1960	1958	1956	1954	1952	1951	1950	1948	1946
	30	1950	1948	1946	1944	1942	1940	1938	1937	1935	1934
	40	1937	1935	1933	1931	1929	1927	1926	1925	1923	1921
	50	1925	1923	1921	1919	1917	1915	1913	1912	1910	1909
61	0	1912	1910	1908	1906	1904	1902	1901	1900	1898	1896
	10	1899	1897	1895	1894	1892	1890	1888	1887	1885	1884
	20	1887	1885	1883	1881	1879	1877	1876	1875	1873	1871
	30	1875	1873	1871	1869	1867	1865	1863	1862	1860	1859
	40	1862	1860	1858	1856	1854	1852	1851	1850	1848	1847

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	° ′ 19 30	° ′ 19 40	° ′ 19 50	° ′ 20 00	° ′ 20 10	° ′ 20 20	° ′ 20 30	° ′ 20 40	° ′ 20 50	° ′ 21 00
54 0	2453	2451	2449	2447	2445	2443	2441	2440	2438	2436
10	2439	2437	2435	2433	2431	2429	2427	2426	2424	2422
20	2425	2423	2421	2419	2417	2415	2413	2412	2410	2408
30	2410	2408	2407	2405	2403	2401	2399	2398	2396	2394
40	2396	2394	2393	2391	2389	2387	2385	2384	2382	2380
50	2382	2380	2379	2377	2375	2373	2371	2370	2368	2366
55 0	2368	2366	2365	2363	2361	2359	2357	2356	2354	2352
10	2355	2353	2351	2349	2347	2346	2344	2342	2341	2339
20	2341	2339	2337	2335	2333	2332	2330	2328	2327	2325
30	2327	2325	2323	2321	2319	2318	2316	2314	2313	2311
40	2313	2311	2310	2308	2306	2304	2302	2301	2299	2297
50	2299	2297	2296	2294	2292	2291	2289	2287	2286	2284
56 0	2286	2284	2282	2280	2278	2277	2275	2273	2272	2270
10	2272	2270	2269	2267	2265	2264	2262	2260	2259	2257
20	2259	2257	2255	2253	2251	2250	2248	2246	2245	2243
30	2245	2243	2242	2240	2238	2236	2234	2233	2231	2229
40	2231	2229	2228	2226	2224	2223	2221	2219	2218	2216
50	2218	2216	2215	2213	2211	2210	2208	2206	2205	2203
57 0	2205	2203	2201	2199	2197	2196	2194	2192	2191	2189
10	2191	2189	2188	2186	2184	2183	2181	2179	2178	2176
20	2178	2176	2175	2173	2171	2170	2168	2166	2165	2163
30	2165	2163	2161	2159	2157	2156	2154	2152	2151	2149
40	2151	2149	2148	2146	2144	2143	2141	2139	2138	2136
50	2138	2136	2135	2133	2131	2130	2128	2126	2125	2123
58 0	2125	2123	2122	2120	2118	2117	2115	2113	2112	2110
10	2112	2110	2109	2107	2105	2104	2102	2100	2099	2097
20	2099	2097	2095	2093	2091	2090	2088	2087	2086	2084
30	2086	2084	2082	2080	2078	2077	2075	2074	2073	2071
40	2073	2071	2069	2067	2065	2064	2062	2061	2060	2058
50	2060	2058	2056	2054	2052	2051	2049	2048	2047	2045
59 0	2047	2045	2043	2041	2039	2038	2036	2035	2034	2032
10	2034	2032	2031	2029	2027	2026	2024	2022	2021	2019
20	2021	2019	2018	2016	2014	2013	2011	2009	2008	2006
30	2008	2006	2005	2003	2001	2000	1998	1996	1995	1993
40	1995	1993	1992	1990	1988	1987	1985	1984	1983	1981
50	1983	1981	1979	1977	1975	1974	1972	1971	1970	1968
60 0	1970	1968	1967	1965	1963	1962	1960	1958	1957	1955
10	1957	1955	1954	1952	1950	1949	1947	1946	1945	1943
20	1944	1942	1941	1939	1937	1936	1934	1933	1932	1930
30	1932	1930	1929	1927	1925	1924	1922	1920	1919	1917
40	1919	1917	1916	1914	1912	1911	1909	1908	1907	1905
50	1907	1905	1904	1902	1900	1899	1897	1895	1894	1892
61 0	1894	1892	1891	1889	1887	1886	1884	1883	1882	1880
10	1882	1880	1879	1877	1875	1874	1872	1871	1870	1868
20	1869	1867	1866	1864	1862	1861	1859	1858	1857	1855
30	1857	1855	1854	1852	1850	1849	1847	1846	1845	1843
40	1845	1843	1842	1840	1838	1837	1835	1834	1833	1831

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	8
6	9
7	10
8	11
9	12

Moon's Hor. Par. ′	″	*Apparent altitude of Moon's centre.* 28° 30′	29° 00′	29° 30′	30° 00′	30° 30′	31° 00′	31° 30′	32° 00′	32° 30′	33° 00′
54	0	2382	2379	2376	2374	2372	2370	2368	2366	2363	2361
	10	2368	2365	2362	2360	2358	2356	2354	2352	2349	2347
	20	2354	2351	2348	2346	2344	2342	2340	2338	2336	2334
	30	2341	2338	2335	2333	2330	2328	2326	2324	2322	2320
	40	2327	2324	2321	2319	2316	2314	2312	2310	2308	2306
	50	2313	2310	2307	2305	2302	2300	2298	2296	2294	2292
55	0	2299	2296	2293	2291	2289	2287	2285	2283	2281	2279
	10	2286	2283	2280	2278	2275	2273	2271	2269	2267	2265
	20	2272	2269	2266	2264	2262	2260	2258	2256	2254	2252
	30	2258	2255	2253	2251	2248	2246	2244	2242	2240	2238
	40	2245	2242	2239	2237	2235	2233	2231	2229	2227	2225
	50	2231	2228	2226	2224	2221	2219	2217	2215	2213	2211
56	0	2218	2215	2213	2211	2208	2206	2204	2202	2200	2198
	10	2205	2202	2199	2197	2194	2192	2190	2188	2186	2184
	20	2191	2188	2185	2183	2181	2179	2177	2175	2173	2171
	30	2178	2175	2172	2170	2168	2166	2164	2162	2160	2158
	40	2165	2162	2159	2157	2155	2153	2150	2148	2146	2145
	50	2151	2148	2146	2144	2141	2139	2137	2135	2133	2131
57	0	2138	2135	2132	2130	2128	2126	2124	2122	2120	2118
	10	2125	2122	2119	2117	2115	2113	2111	2109	2107	2105
	20	2112	2109	2106	2104	2102	2100	2098	2096	2094	2092
	30	2099	2096	2093	2091	2089	2087	2085	2083	2081	2079
	40	2086	2083	2080	2078	2076	2074	2072	2070	2068	2066
	50	2073	2070	2067	2065	2063	2061	2059	2057	2055	2053
58	0	2059	2057	2054	2052	2050	2048	2046	2044	2042	2040
	10	2046	2044	2041	2039	2037	2035	2033	2031	2029	2027
	20	2033	2031	2028	2026	2024	2022	2020	2018	2016	2014
	30	2020	2018	2015	2013	2011	2009	2007	2005	2003	2002
	40	2007	2005	2003	2001	1998	1996	1994	1993	1991	1989
	50	1994	1992	1990	1988	1986	1984	1982	1980	1978	1976
59	0	1982	1980	1977	1975	1973	1971	1969	1967	1965	1963
	10	1969	1967	1964	1962	1960	1958	1956	1954	1952	1951
	20	1956	1954	1952	1950	1948	1946	1944	1942	1940	1938
	30	1944	1942	1939	1937	1935	1933	1931	1929	1927	1925
	40	1931	1929	1927	1925	1923	1921	1919	1917	1915	1913
	50	1918	1916	1914	1912	1910	1908	1906	1904	1902	1900
60	0	1906	1904	1902	1900	1898	1896	1894	1892	1890	1888
	10	1893	1891	1889	1887	1885	1883	1881	1879	1877	1875
	20	1881	1879	1877	1875	1873	1871	1869	1867	1865	1863
	30	1869	1867	1864	1862	1860	1858	1856	1854	1852	1851
	40	1856	1854	1852	1850	1848	1846	1844	1842	1840	1838
	50	1844	1842	1839	1837	1835	1833	1831	1830	1828	1826
61	0	1832	1830	1827	1825	1823	1821	1819	1817	1815	1814
	10	1819	1817	1815	1813	1811	1809	1807	1805	1803	1802
	20	1807	1805	1803	1801	1799	1797	1795	1793	1791	1789
	30	1795	1793	1791	1789	1787	1785	1783	1781	1779	1777
	40	1783	1781	1778	1776	1774	1772	1770	1769	1767	1765

TABLE A.

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	9
7	10
8	11
9	12

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	° ′ 33 30	° ′ 34 00	° ′ 34 30	° ′ 35 00	° ′ 35 30	° ′ 36 00	° ′ 36 30	° ′ 37 00	° ′ 37 30	° ′ 38 00
54 0	2359	2358	2356	2354	2352	2351	2349	2348	2346	2345
10	2345	2344	2342	2340	2338	2337	2335	2334	2332	2331
20	2332	2330	2328	2326	2324	2323	2321	2320	2318	2317
30	2318	2316	2314	2313	2311	2309	2307	2306	2304	2303
40	2304	2302	2300	2299	2297	2296	2294	2293	2291	2290
50	2290	2289	2287	2285	2283	2282	2280	2279	2277	2276
55 0	2277	2275	2274	2272	2270	2268	2266	2265	2264	2263
10	2263	2262	2260	2258	2256	2255	2253	2252	2250	2249
20	2250	2248	2246	2245	2243	2241	2239	2238	2236	2235
30	2236	2234	2232	2231	2229	2228	2226	2225	2223	2222
40	2223	2221	2219	2218	2216	2214	2212	2211	2210	2209
50	2209	2208	2206	2204	2202	2201	2199	2198	2196	2195
56 0	2196	2194	2192	2191	2189	2188	2186	2185	2183	2182
10	2182	2181	2179	2177	2175	2174	2173	2171	2169	2168
20	2169	2168	2166	2164	2162	2161	2159	2158	2156	2155
30	2156	2154	2152	2151	2149	2148	2146	2145	2143	2142
40	2143	2141	2139	2138	2136	2135	2133	2132	2130	2129
50	2129	2128	2126	2124	2122	2121	2119	2118	2117	2116
57 0	2116	2115	2113	2111	2109	2108	2106	2105	2104	2103
10	2103	2102	2100	2098	2096	2095	2093	2092	2090	2089
20	2090	2089	2087	2085	2083	2082	2080	2079	2077	2076
30	2077	2076	2074	2072	2070	2069	2067	2066	2064	2063
40	2064	2063	2061	2059	2057	2056	2054	2053	2051	2050
50	2051	2050	2048	2046	2044	2043	2041	2040	2039	2038
58 0	2038	2037	2035	2033	2031	2030	2028	2027	2026	2025
10	2025	2024	2022	2020	2018	2017	2016	2015	2013	2012
20	2013	2011	2009	2008	2006	2005	2003	2002	2000	1999
30	2000	1998	1996	1995	1993	1992	1990	1989	1987	1986
40	1987	1985	1983	1982	1980	1979	1977	1976	1975	1974
50	1974	1973	1971	1969	1967	1966	1965	1964	1962	1961
59 0	1961	1960	1958	1957	1955	1954	1952	1951	1949	1948
10	1949	1947	1945	1944	1942	1941	1939	1938	1937	1936
20	1936	1935	1933	1931	1930	1929	1927	1926	1924	1923
30	1923	1922	1920	1919	1917	1916	1914	1913	1911	1910
40	1911	1910	1908	1906	1904	1903	1902	1901	1899	1898
50	1898	1897	1895	1894	1892	1891	1889	1888	1886	1885
60 0	1886	1885	1883	1881	1880	1879	1877	1876	1874	1873
10	1873	1872	1870	1869	1867	1866	1864	1863	1862	1861
20	1861	1860	1858	1857	1855	1854	1852	1851	1849	1848
30	1849	1847	1845	1844	1842	1841	1840	1839	1837	1836
40	1836	1835	1833	1832	1830	1829	1827	1826	1825	1824
50	1824	1823	1821	1820	1818	1817	1815	1814	1812	1811
61 0	1812	1811	1809	1807	1806	1805	1803	1802	1800	1799
10	1800	1798	1796	1795	1793	1792	1791	1790	1788	1787
20	1787	1786	1784	1783	1781	1780	1778	1777	1776	1775
30	1775	1774	1772	1771	1769	1768	1766	1765	1764	1763
40	1763	1762	1760	1759	1757	1756	1754	1753	1752	1751

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

Moon's Hor. Par.	*Apparent altitude of Moon's centre.*									
′ ″	° ′ 28 30	° ′ 29 00	° ′ 29 30	° ′ 30 00	° ′ 30 30	° ′ 31 00	° ′ 31 30	° ′ 32 00	° ′ 32 30	° ′ 33 00
54 0	2382	2379	2376	2374	2372	2370	2368	2366	2363	2361
10	2368	2365	2362	2360	2358	2356	2354	2352	2349	2347
20	2354	2351	2348	2346	2344	2342	2340	2338	2336	2334
30	2341	2338	2335	2333	2330	2328	2326	2324	2322	2320
40	2327	2324	2321	2319	2316	2314	2312	2310	2308	2306
50	2313	2310	2307	2305	2302	2300	2298	2296	2294	2292
55 0	2299	2296	2293	2291	2289	2287	2285	2283	2281	2279
10	2286	2283	2280	2278	2275	2273	2271	2269	2267	2265
20	2272	2269	2266	2264	2262	2260	2258	2256	2254	2252
30	2258	2255	2253	2251	2248	2246	2244	2242	2240	2238
40	2245	2242	2239	2237	2235	2233	2231	2229	2227	2225
50	2231	2228	2226	2224	2221	2219	2217	2215	2213	2211
56 0	2218	2215	2213	2211	2208	2206	2204	2202	2200	2198
10	2205	2202	2199	2197	2194	2192	2190	2188	2186	2184
20	2191	2188	2185	2183	2181	2179	2177	2175	2173	2171
30	2178	2175	2172	2170	2168	2166	2164	2162	2160	2158
40	2165	2162	2159	2157	2155	2153	2150	2148	2146	2145
50	2151	2148	2146	2144	2141	2139	2137	2135	2133	2131
57 0	2138	2135	2132	2130	2128	2126	2124	2122	2120	2118
10	2125	2122	2119	2117	2115	2113	2111	2109	2107	2105
20	2112	2109	2106	2104	2102	2100	2098	2096	2094	2092
30	2099	2096	2093	2091	2089	2087	2085	2083	2081	2079
40	2086	2083	2080	2078	2076	2074	2072	2070	2068	2066
50	2073	2070	2067	2065	2063	2061	2059	2057	2055	2053
58 0	2059	2057	2054	2052	2050	2048	2046	2044	2042	2040
10	2046	2044	2041	2039	2037	2035	2033	2031	2029	2027
20	2033	2031	2028	2026	2024	2022	2020	2018	2016	2014
30	2020	2018	2015	2013	2011	2009	2007	2005	2003	2002
40	2007	2005	2003	2001	1998	1996	1994	1993	1991	1989
50	1994	1992	1990	1988	1986	1984	1982	1980	1978	1976
59 0	1982	1980	1977	1975	1973	1971	1969	1967	1965	1963
10	1969	1967	1964	1962	1960	1958	1956	1954	1952	1951
20	1956	1954	1952	1950	1948	1946	1944	1942	1940	1938
30	1944	1942	1939	1937	1935	1933	1931	1929	1927	1925
40	1931	1929	1927	1925	1923	1921	1919	1917	1915	1913
50	1918	1916	1914	1912	1910	1908	1906	1904	1902	1900
60 0	1906	1904	1902	1900	1898	1896	1894	1892	1890	1888
10	1893	1891	1889	1887	1885	1883	1881	1879	1877	1875
20	1881	1879	1877	1875	1873	1871	1869	1867	1865	1863
30	1869	1867	1864	1862	1860	1858	1856	1854	1852	1851
40	1856	1854	1852	1850	1848	1846	1844	1842	1840	1838
50	1844	1842	1839	1837	1835	1833	1831	1830	1828	1826
61 0	1832	1830	1827	1825	1823	1821	1819	1817	1815	1814
10	1819	1817	1815	1813	1811	1809	1807	1805	1803	1802
20	1807	1805	1803	1801	1799	1797	1795	1793	1791	1789
30	1795	1793	1791	1789	1787	1785	1783	1781	1779	1777
40	1783	1781	1778	1776	1774	1772	1770	1769	1767	1765

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	9
7	10
8	11
9	12

Moon's Hor. Par.		Apparent altitude of Moon's centre.									
′	″	° ′ 33 30	° ′ 34 00	° ′ 34 30	° ′ 35 00	° ′ 35 30	° ′ 36 00	° ′ 36 30	° ′ 37 00	° ′ 37 30	° ′ 38 00
54	0	2359	2358	2356	2354	2352	2351	2349	2348	2346	2345
	10	2345	2344	2342	2340	2338	2337	2335	2334	2332	2331
	20	2332	2330	2328	2326	2324	2323	2321	2320	2318	2317
	30	2318	2316	2314	2313	2311	2309	2307	2306	2304	2303
	40	2304	2302	2300	2299	2297	2296	2294	2293	2291	2290
	50	2290	2289	2287	2285	2283	2282	2280	2279	2277	2276
55	0	2277	2275	2274	2272	2270	2268	2266	2265	2264	2263
	10	2263	2262	2260	2258	2256	2255	2253	2252	2250	2249
	20	2250	2248	2246	2245	2243	2241	2239	2238	2236	2235
	30	2236	2234	2232	2231	2229	2228	2226	2225	2223	2222
	40	2223	2221	2219	2218	2216	2214	2212	2211	2210	2209
	50	2209	2208	2206	2204	2202	2201	2199	2198	2196	2195
56	0	2196	2194	2192	2191	2189	2188	2186	2185	2183	2182
	10	2182	2181	2179	2177	2175	2174	2173	2171	2169	2168
	20	2169	2168	2166	2164	2162	2161	2159	2158	2156	2155
	30	2156	2154	2152	2151	2149	2148	2146	2145	2143	2142
	40	2143	2141	2139	2138	2136	2135	2133	2132	2130	2129
	50	2129	2128	2126	2124	2122	2121	2119	2118	2117	2116
57	0	2116	2115	2113	2111	2109	2108	2106	2105	2104	2103
	10	2103	2102	2100	2098	2096	2095	2093	2092	2090	2089
	20	2090	2089	2087	2085	2083	2082	2080	2079	2077	2076
	30	2077	2076	2074	2072	2070	2069	2067	2066	2064	2063
	40	2064	2063	2061	2059	2057	2056	2054	2053	2051	2050
	50	2051	2050	2048	2046	2044	2043	2041	2040	2039	2038
58	0	2058	2037	2035	2033	2031	2030	2028	2027	2026	2025
	10	2025	2024	2022	2020	2018	2017	2016	2015	2013	2012
	20	2013	2011	2009	2008	2006	2005	2003	2002	2000	1999
	30	2000	1998	1996	1995	1993	1992	1990	1989	1987	1986
	40	1987	1985	1983	1982	1980	1979	1977	1976	1975	1974
	50	1974	1973	1971	1969	1967	1966	1965	1964	1962	1961
59	0	1961	1960	1958	1957	1955	1954	1952	1951	1949	1948
	10	1949	1947	1945	1944	1942	1941	1939	1938	1937	1936
	20	1936	1935	1933	1931	1930	1929	1927	1926	1924	1923
	30	1923	1922	1920	1919	1917	1916	1914	1913	1911	1910
	40	1911	1910	1908	1906	1904	1903	1902	1901	1899	1898
	50	1898	1897	1895	1894	1892	1891	1889	1888	1886	1885
60	0	1886	1885	1883	1881	1880	1879	1877	1876	1874	1873
	10	1873	1872	1870	1869	1867	1866	1864	1863	1862	1861
	20	1861	1860	1858	1857	1855	1854	1852	1851	1849	1848
	30	1849	1847	1845	1844	1842	1841	1840	1839	1837	1836
	40	1836	1835	1833	1832	1830	1829	1827	1826	1825	1824
	50	1824	1823	1821	1820	1818	1817	1815	1814	1812	1811
61	0	1812	1811	1809	1807	1806	1805	1803	1802	1800	1799
	10	1800	1798	1796	1795	1793	1792	1791	1790	1788	1787
	20	1787	1786	1784	1783	1781	1780	1778	1777	1776	1775
	30	1775	1774	1772	1771	1769	1768	1766	1765	1764	1763
	40	1763	1762	1760	1759	1757	1756	1754	1753	1752	1751

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

Apparent altitude of Moon's centre.

Moon's Hor. Par. ′ ″	38° 30′	39° 00′	39° 30′	40° 00′	40° 30′	41° 00′	41° 30′	42° 00′	42° 30′	43° 00′
54 0	2343	2342	2341	2340	2338	2337	2336	2335	2334	2333
10	2329	2328	2327	2326	2324	2323	2322	2321	2320	2319
20	2315	2314	2313	2312	2310	2309	2308	2307	2306	2305
30	2302	2301	2300	2298	2297	2296	2294	2293	2292	2291
40	2288	2287	2286	2285	2283	2282	2281	2280	2279	2278
50	2274	2273	2272	2271	2270	2268	2267	2266	2265	2264
55 0	2261	2260	2258	2257	2256	2255	2254	2253	2251	2250
10	2247	2246	2245	2244	2242	2241	2240	2239	2238	2237
20	2234	2233	2232	2230	2229	2228	2227	2226	2224	2223
30	2220	2219	2218	2217	2215	2214	2213	2212	2211	2210
40	2207	2206	2204	2203	2202	2201	2200	2199	2198	2197
50	2193	2192	2191	2190	2189	2188	2186	2185	2184	2183
56 0	2180	2179	2178	2177	2175	2174	2173	2172	2171	2170
10	2167	2166	2164	2163	2162	2161	2160	2159	2158	2157
20	2153	2152	2151	2150	2149	2148	2147	2146	2144	2143
30	2140	2139	2138	2137	2135	2134	2133	2132	2131	2130
40	2127	2126	2125	2124	2122	2121	2120	2119	2118	2117
50	2114	2113	2112	2111	2109	2108	2107	2106	2105	2104
57 0	2101	2100	2099	2097	2096	2095	2094	2093	2092	2091
10	2088	2087	2086	2084	2083	2082	2081	2080	2079	2078
20	2075	2074	2073	2071	2070	2069	2068	2067	2066	2065
30	2062	2061	2060	2058	2057	2056	2055	2054	2053	2052
40	2049	2048	2047	2046	2044	2043	2042	2041	2040	2039
50	2036	2035	2034	2033	2031	2030	2029	2028	2027	2026
58 0	2023	2022	2021	2020	2018	2017	2016	2015	2014	2013
10	2010	2009	2008	2007	2006	2005	2003	2002	2001	2000
20	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988
30	1985	1984	1982	1981	1980	1979	1978	1977	1976	1975
40	1973	1971	1970	1969	1967	1966	1965	1964	1963	1962
50	1960	1958	1957	1956	1955	1954	1953	1952	1951	1950
59 0	1947	1946	1944	1943	1942	1941	1940	1939	1938	1937
10	1934	1933	1932	1931	1929	1928	1927	1926	1925	1924
20	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912
30	1909	1908	1907	1906	1904	1903	1902	1901	1900	1899
40	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887
50	1884	1883	1882	1881	1879	1878	1877	1876	1875	1874
60 0	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862
10	1859	1858	1857	1856	1855	1854	1853	1852	1851	1850
20	1847	1846	1845	1844	1843	1841	1840	1839	1838	1837
30	1834	1833	1832	1831	1830	1829	1828	1827	1826	1825
40	1822	1821	1820	1819	1818	1817	1816	1815	1814	1813
50	1810	1809	1808	1807	1805	1804	1803	1802	1801	1800
61 0	1798	1797	1796	1795	1793	1792	1791	1790	1789	1788
10	1785	1784	1783	1782	1781	1780	1779	1778	1777	1776
20	1773	1772	1771	1770	1769	1768	1767	1766	1765	1764
30	1761	1760	1759	1758	1757	1756	1755	1754	1753	1752
40	1749	1748	1747	1746	1745	1744	1743	1742	1741	1740

TABLE A.

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Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	9
7	10
8	11
9	12

Moon's Hor. Par.	Apparent altitude of Moon's centre.									
′ ″	° ′ 43 30	° ′ 44 00	° ′ 44 30	° ′ 45 00	° ′ 45 30	° ′ 46 00	° ′ 47 00	° ′ 48 00	° ′ 49 00	° ′ 50 00
54 0	2332	2331	2330	2329	2328	2327	2325	2323	2322	2320
10	2318	2317	2316	2315	2314	2313	2311	2309	2308	2306
20	2304	2303	2302	2301	2300	2299	2297	2296	2294	2293
30	2290	2289	2288	2287	2286	2285	2284	2282	2280	2279
40	2277	2276	2275	2274	2273	2272	2270	2268	2267	2265
50	2263	2262	2261	2260	2259	2258	2256	2255	2253	2252
55 0	2249	2248	2247	2246	2246	2245	2243	2241	2240	2238
10	2236	2235	2234	2233	2232	2231	2229	2228	2226	2225
20	2222	2221	2220	2219	2219	2218	2216	2214	2213	2211
30	2209	2208	2207	2206	2205	2204	2203	2201	2199	2198
40	2196	2195	2194	2193	2192	2191	2189	2188	2186	2184
50	2182	2181	2180	2179	2179	2178	2176	2174	2173	2171
56 0	2169	2168	2167	2166	2165	2164	2163	2161	2159	2158
10	2156	2155	2154	2153	2152	2151	2149	2148	2146	2145
20	2142	2141	2140	2139	2138	2138	2136	2134	2133	2131
30	2129	2128	2127	2126	2125	2125	2123	2121	2120	2118
40	2116	2115	2114	2113	2112	2111	2110	2108	2107	2105
50	2103	2102	2101	2100	2099	2098	2097	2095	2093	2092
57 0	2090	2089	2088	2087	2086	2085	2084	2082	2080	2079
10	2077	2076	2075	2074	2073	2072	2071	2069	2067	2066
20	2064	2063	2062	2061	2060	2059	2058	2056	2054	2053
30	2051	2050	2049	2048	2047	2046	2045	2043	2042	2040
40	2038	2037	2036	2035	2034	2033	2032	2030	2029	2027
50	2025	2024	2023	2022	2021	2021	2019	2017	2016	2014
58 0	2012	2011	2010	2009	2008	2008	2006	2005	2003	2002
10	1999	1998	1998	1997	1996	1995	1993	1992	1990	1989
20	1987	1986	1985	1984	1983	1982	1981	1979	1977	1976
30	1974	1973	1972	1971	1970	1970	1968	1966	1965	1963
40	1961	1960	1959	1958	1957	1957	1955	1954	1952	1951
50	1949	1948	1947	1946	1945	1944	1943	1941	1939	1938
59 0	1936	1935	1934	1933	1932	1932	1930	1928	1927	1926
10	1923	1922	1922	1921	1920	1919	1917	1916	1914	1913
20	1911	1910	1909	1908	1907	1906	1905	1903	1902	1901
30	1898	1897	1897	1896	1895	1894	1892	1891	1889	1888
40	1886	1885	1884	1883	1882	1882	1880	1878	1877	1876
50	1873	1872	1872	1871	1870	1869	1867	1866	1864	1863
60 0	1861	1860	1859	1858	1857	1857	1855	1854	1852	1851
10	1849	1848	1847	1846	1845	1844	1843	1841	1840	1838
20	1836	1835	1835	1834	1833	1832	1830	1829	1827	1826
30	1824	1823	1822	1821	1820	1820	1818	1817	1815	1814
40	1812	1811	1810	1809	1808	1808	1806	1804	1803	1802
50	1800	1799	1798	1797	1796	1795	1794	1792	1791	1789
61 0	1787	1786	1786	1785	1784	1783	1782	1780	1779	1777
10	1775	1774	1774	1773	1772	1771	1769	1768	1766	1765
20	1763	1762	1761	1760	1759	1759	1757	1756	1754	1753
30	1751	1750	1749	1748	1747	1747	1745	1744	1742	1741
40	1739	1738	1737	1736	1735	1735	1733	1732	1730	1729

TABLE A.

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Correction for seconds of parallax.—Sub-tract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

Moon's Hor. Par.		*Apparent altitude of Moon's centre.*									
°	″	51° 00′	52° 00′	53° 0′	54° 00′	55° 00′	56° 00′	57° 00′	58° 00′	59° 00′	60° 00′
54	0	2319	2317	2316	2315	2314	2312	2311	2310	2309	2309
	10	2305	2303	2302	2301	2300	2298	2297	2296	2295	2295
	20	2291	2290	2288	2287	2286	2285	2284	2283	2282	2281
	30	2277	2276	2275	2274	2272	2271	2270	2269	2268	2267
	40	2264	2262	2261	2260	2259	2258	2257	2256	2254	2254
	50	2250	2249	2248	2246	2245	2244	2243	2242	2241	2240
55	0	2237	2235	2234	2233	2232	2230	2230	2229	2227	2227
	10	2223	2222	2221	2219	2218	2217	2216	2215	2214	2213
	20	2210	2208	2207	2206	2205	2204	2203	2202	2201	2200
	30	2196	2195	2194	2193	2191	2190	2189	2188	2187	2186
	40	2183	2182	2180	2179	2178	2177	2176	2175	2174	2173
	50	2170	2168	2167	2166	2165	2164	2163	2162	2161	2160
56	0	2156	2155	2154	2153	2152	2150	2149	2148	2147	2147
	10	2143	2142	2141	2139	2138	2137	2136	2135	2134	2133
	20	2130	2129	2127	2126	2125	2124	2123	2122	2121	2120
	30	2117	2116	2114	2113	2112	2111	2110	2109	2108	2107
	40	2104	2102	2101	2100	2099	2098	2097	2096	2095	2094
	50	2091	2089	2088	2087	2086	2085	2084	2083	2082	2081
57	0	2078	2076	2075	2074	2073	2072	2071	2070	2069	2068
	10	2065	2063	2062	2061	2060	2059	2058	2057	2056	2055
	20	2052	2050	2049	2048	2047	2046	2045	2044	2043	2042
	30	2039	2037	2036	2035	2034	2033	2032	2031	2030	2029
	40	2026	2025	2023	2022	2021	2020	2019	2018	2017	2016
	50	2013	2012	2010	2009	2008	2007	2006	2005	2004	2004
58	0	2000	1999	1998	1997	1996	1994	1993	1992	1991	1991
	10	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978
	20	1975	1973	1972	1971	1970	1969	1968	1967	1966	1965
	30	1962	1961	1960	1958	1957	1956	1955	1954	1953	1953
	40	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
	50	1937	1936	1934	1933	1932	1931	1930	1929	1928	1927
59	0	1924	1923	1922	1921	1920	1918	1917	1917	1916	1915
	10	1912	1910	1909	1908	1907	1906	1905	1904	1903	1902
	20	1899	1898	1897	1896	1895	1893	1892	1892	1891	1890
	30	1887	1885	1884	1883	1882	1881	1880	1879	1878	1877
	40	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865
	50	1862	1861	1859	1858	1857	1856	1855	1854	1853	1853
60	0	1849	1848	1847	1846	1845	1844	1843	1842	1841	1840
	10	1837	1836	1835	1834	1833	1832	1831	1830	1829	1828
	20	1825	1824	1822	1821	1820	1819	1818	1817	1816	1816
	30	1813	1811	1810	1809	1808	1807	1806	1805	1804	1803
	40	1800	1799	1798	1797	1796	1795	1794	1793	1792	1791
	50	1788	1787	1786	1785	1784	1783	1782	1781	1780	1779
61	0	1776	1775	1774	1773	1771	1770	1770	1769	1768	1767
	10	1764	1763	1761	1760	1759	1758	1757	1757	1756	1755
	20	1752	1751	1749	1748	1747	1746	1745	1744	1743	1743
	30	1740	1739	1737	1736	1735	1734	1733	1732	1731	1731
	40	1728	1727	1725	1724	1723	1722	1721	1720	1719	1719

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

Moon's Hor. Par. ′ ″	Apparent altitude of Moon's centre. 61° 00′	62° 00′	63° 00′	64° 00′	65° 00′	66° 00′	67° 00′	68° 00′	69° 00′	70° 00′
54 0	2308	2307	2306	2305	2305	2304	2303	2303	2302	2301
10	2294	2293	2292	2291	2291	2290	2289	2289	2288	2287
20	2280	2279	2278	2278	2277	2276	2276	2275	2274	2274
30	2266	2266	2265	2264	2263	2263	2262	2261	2261	2260
40	2253	2252	2251	2250	2250	2249	2248	2248	2247	2247
50	2239	2238	2238	2237	2236	2236	2235	2234	2234	2233
55 0	2226	2225	2224	2223	2223	2222	2221	2221	2220	2220
10	2212	2212	2211	2210	2209	2209	2208	2207	2207	2206
20	2199	2198	2197	2197	2196	2195	2195	2194	2194	2193
30	2186	2185	2184	2183	2183	2182	2181	2181	2180	2179
40	2172	2171	2171	2170	2169	2169	2168	2167	2167	2166
50	2159	2158	2157	2157	2156	2155	2155	2154	2154	2153
56 0	2146	2145	2144	2143	2143	2142	2141	2141	2140	2140
10	2133	2132	2131	2130	2130	2129	2128	2128	2127	2126
20	2119	2119	2118	2117	2116	2116	2115	2114	2114	2113
30	2106	2105	2105	2104	2103	2103	2102	2101	2101	2100
40	2093	2092	2092	2091	2090	2090	2089	2088	2088	2087
50	2080	2079	2078	2078	2077	2077	2076	2075	2075	2074
57 0	2067	2066	2065	2065	2064	2064	2063	2062	2062	2061
10	2054	2053	2053	2052	2051	2051	2050	2049	2049	2048
20	2041	2040	2040	2039	2038	2038	2037	2036	2036	2035
30	2028	2028	2027	2026	2025	2025	2024	2024	2023	2022
40	2016	2015	2014	2013	2013	2012	2011	2011	2010	2010
50	2003	2002	2001	2000	2000	1999	1999	1998	1998	1997
58 0	1990	1989	1988	1988	1987	1986	1986	1985	1985	1984
10	1977	1976	1976	1975	1974	1974	1973	1972	1972	1971
20	1965	1964	1963	1962	1962	1961	1960	1960	1959	1959
30	1952	1951	1950	1950	1949	1948	1948	1947	1947	1946
40	1939	1938	1938	1937	1936	1936	1935	1934	1934	1933
50	1927	1926	1925	1924	1924	1923	1923	1922	1921	1921
59 0	1914	1913	1912	1912	1911	1911	1910	1909	1909	1908
10	1902	1901	1900	1899	1899	1898	1898	1897	1896	1896
20	1889	1888	1887	1887	1886	1886	1885	1884	1884	1883
30	1877	1876	1875	1874	1874	1873	1873	1872	1872	1871
40	1864	1863	1863	1862	1861	1861	1860	1860	1859	1858
50	1852	1851	1850	1850	1849	1848	1848	1847	1847	1846
60 0	1840	1839	1838	1837	1837	1836	1836	1835	1834	1834
10	1827	1826	1826	1825	1824	1824	1823	1823	1822	1822
20	1815	1814	1813	1813	1812	1812	1811	1810	1810	1809
30	1803	1802	1801	1801	1800	1799	1799	1798	1798	1797
40	1791	1790	1789	1788	1788	1787	1787	1786	1786	1785
50	1778	1778	1777	1776	1776	1775	1774	1774	1773	1773
61 0	1766	1765	1765	1764	1763	1763	1762	1762	1761	1761
10	1754	1753	1753	1752	1751	1751	1750	1750	1749	1749
20	1742	1741	1740	1740	1739	1739	1738	1737	1737	1736
30	1730	1729	1728	1728	1727	1727	1726	1725	1725	1724
40	1718	1717	1716	1716	1715	1715	1714	1713	1713	1712

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

Moon's Hor. Par.		Apparent altitude of Moon's centre.									
′	″	° ′ 71 00	° ′ 72 00	° ′ 73 00	° ′ 74 00	° ′ 75 00	° ′ 76 00	° ′ 77 00	° ′ 78 00	° ′ 79 00	° ′ 80 00
54	0	2301	2300	2300	2299	2299	2299	2298	2298	2298	2297
	10	2287	2286	2286	2285	2285	2285	2284	2284	2284	2283
	20	2273	2273	2272	2272	2272	2271	2271	2271	2271	2270
	30	2260	2259	2259	2258	2258	2258	2257	2257	2257	2256
	40	2246	2246	2245	2245	2245	2244	2243	2243	2243	2243
	50	2233	2232	2232	2231	2231	2231	2230	2230	2230	2229
55	0	2219	2219	2218	2218	2218	2217	2217	2216	2216	2216
	10	2206	2205	2205	2204	2204	2204	2203	2203	2203	2202
	20	2192	2192	2191	2191	2191	2190	2190	2190	2190	2189
	30	2179	2179	2178	2178	2178	2177	2176	2176	2176	2176
	40	2166	2165	2165	2164	2164	2164	2163	2163	2163	2162
	50	2152	2152	2152	2151	2151	2150	2150	2150	2150	2149
56	0	2139	2139	2138	2138	2138	2137	2137	2137	2137	2136
	10	2126	2126	2125	2125	2125	2124	2123	2123	2123	2123
	20	2113	2112	2112	2112	2111	2111	2110	2110	2110	2109
	30	2100	2099	2099	2098	2098	2098	2097	2097	2097	2096
	40	2087	2086	2086	2085	2085	2085	2084	2084	2084	2083
	50	2074	2073	2073	2072	2072	2072	2071	2071	2071	2070
57	0	2061	2060	2060	2059	2059	2059	2058	2058	2058	2057
	10	2048	2047	2047	2046	2046	2046	2045	2045	2045	2044
	20	2035	2034	2034	2034	2033	2033	2032	2032	2032	2032
	30	2022	2022	2021	2021	2021	2020	2019	2019	2019	2019
	40	2009	2009	2008	2008	2008	2007	2007	2007	2007	2006
	50	1996	1996	1995	1995	1995	1994	1994	1994	1994	1993
58	0	1984	1983	1983	1982	1982	1982	1981	1981	1981	1980
	10	1971	1970	1970	1970	1970	1969	1968	1968	1968	1968
	20	1958	1958	1957	1957	1957	1956	1956	1956	1956	1955
	30	1946	1945	1945	1944	1944	1944	1943	1943	1943	1942
	40	1933	1933	1932	1932	1932	1931	1931	1930	1930	1930
	50	1920	1920	1920	1919	1919	1919	1918	1918	1918	1917
59	0	1908	1907	1907	1907	1907	1906	1905	1905	1905	1905
	10	1895	1895	1895	1894	1894	1893	1893	1893	1893	1892
	20	1883	1882	1882	1882	1882	1881	1880	1880	1880	1880
	30	1870	1870	1870	1869	1869	1869	1868	1868	1868	1867
	40	1858	1858	1857	1857	1857	1856	1856	1856	1856	1855
	50	1846	1845	1845	1844	1844	1844	1843	1843	1843	1843
60	0	1833	1833	1833	1832	1832	1832	1831	1831	1831	1830
	10	1821	1821	1820	1820	1820	1819	1819	1819	1819	1818
	20	1809	1808	1808	1808	1808	1807	1806	1806	1806	1806
	30	1797	1796	1796	1795	1795	1795	1794	1794	1794	1793
	40	1784	1784	1784	1783	1783	1783	1782	1782	1782	1781
	50	1772	1772	1771	1771	1771	1770	1770	1770	1770	1769
61	0	1760	1760	1759	1759	1759	1758	1758	1758	1758	1757
	10	1748	1748	1747	1747	1747	1746	1746	1746	1746	1745
	20	1736	1736	1735	1735	1735	1734	1734	1734	1734	1733
	30	1724	1724	1723	1723	1723	1722	1722	1722	1722	1721
	40	1712	1712	1711	1711	1711	1710	1710	1710	1710	1709

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Sec'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

Moon's Hor. Par.	Apparent altitude of Moon's centre.								
′ ″	° ′ 81 00	° ′ 82 00	° ′ 83 00	° ′ 84 00	° ′ 85 00	° ′ 86 00	° ′ 87 00	° ′ 88 00	° ′ 89 00
54 0	2297	2297	2297	2297	2297	2297	2297	2297	2297
10	2283	2283	2283	2283	2283	2283	2283	2283	2283
20	2270	2270	2270	2269	2269	2269	2269	2269	2269
30	2256	2256	2256	2256	2256	2256	2256	2256	2256
40	2243	2242	2242	2242	2242	2242	2242	2242	2242
50	2229	2229	2229	2229	2229	2229	2229	2229	2229
55 0	2216	2216	2215	2215	2215	2215	2215	2215	2215
10	2202	2202	2202	2202	2202	2202	2202	2202	2202
20	2189	2189	2189	2189	2189	2189	2189	2188	2188
30	2175	2175	2175	2175	2175	2175	2175	2175	2175
40	2162	2162	2162	2162	2162	2162	2162	2162	2162
50	2149	2149	2149	2149	2149	2149	2149	2149	2149
56 0	2136	2136	2136	2136	2135	2135	2135	2135	2135
10	2123	2122	2122	2122	2122	2122	2122	2122	2122
20	2109	2109	2109	2109	2109	2109	2109	2109	2109
30	2096	2096	2096	2096	2096	2096	2096	2096	2096
40	2083	2083	2083	2083	2083	2083	2083	2083	2083
50	2070	2070	2070	2070	2070	2070	2070	2070	2070
57 0	2057	2057	2057	2057	2057	2057	2057	2057	2057
10	2044	2044	2044	2044	2044	2044	2044	2044	2044
20	2031	2031	2031	2031	2031	2031	2031	2031	2031
30	2019	2019	2018	2018	2018	2018	2018	2018	2018
40	2006	2006	2006	2006	2006	2006	2005	2005	2005
50	1993	1993	1993	1993	1993	1993	1993	1993	1993
58 0	1980	1980	1980	1980	1980	1980	1980	1980	1980
10	1968	1967	1967	1967	1967	1967	1967	1967	1967
20	1955	1955	1955	1955	1955	1955	1955	1955	1955
30	1942	1942	1942	1942	1942	1942	1942	1942	1942
40	1930	1930	1930	1929	1929	1929	1929	1929	1929
50	1917	1917	1917	1917	1917	1917	1917	1917	1917
59 0	1905	1904	1904	1904	1904	1904	1904	1904	1904
10	1892	1892	1892	1892	1892	1892	1892	1892	1892
20	1880	1880	1879	1879	1879	1879	1879	1879	1879
30	1867	1867	1867	1867	1867	1867	1867	1867	1867
40	1855	1855	1855	1855	1855	1855	1855	1855	1855
50	1842	1842	1842	1842	1842	1842	1842	1842	1842
60 0	1830	1830	1830	1830	1830	1830	1830	1830	1830
10	1818	1818	1818	1818	1818	1818	1818	1818	1818
20	1806	1806	1806	1805	1805	1805	1805	1805	1805
30	1793	1793	1793	1793	1793	1793	1793	1793	1793
40	1781	1781	1781	1781	1781	1781	1781	1781	1781
50	1769	1769	1769	1769	1769	1769	1769	1769	1769
61 0	1757	1757	1757	1757	1757	1757	1757	1757	1757
10	1745	1745	1745	1745	1745	1745	1745	1745	1745
20	1733	1733	1733	1733	1733	1733	1733	1733	1733
30	1721	1721	1721	1721	1721	1721	1721	1721	1721
40	1709	1709	1709	1709	1709	1709	1709	1709	1709

TABLE A.

—

Correction for seconds of parallax.—Subtract.

Seç'ds.	Cor.
1	1
2	2
3	4
4	6
5	7
6	8
7	9
8	10
9	12

TABLE II.—LOGARITHMS.

Star's App. Alt. °	′	Log.	Star's App. Alt. °	′	Log.	Star's App. Alt. °	′	Log.	Star's App. Alt. °	′	Log.	Star's App. Alt. °	′	Log.
5	0	0.9582	10	0	1.2280	13	15	1.3435	19	0	1.4929	36	30	1.7520
	10	0.9699		3	1.2298		20	1.3460		10	1.4961	37	0	1.7570
	20	0.9818		6	1.2320		25	1.3487		20	1.4994		30	1.7620
	30	0.9931		9	1.2335		30	1.3513		30	1.5030	38	0	1.7670
	40	1.0042		12	1.2360		35	1.3540		40	1.5070		30	1.7716
	50	1.0151		15	1.2380		40	1.3564		50	1.5100	39	0	1.7768
6	0	1.0256	10	18	1.2400	13	45	1.3589	20	0	1.5137	39	30	1.7809
	10	1.0362		21	1.2418		50	1.3614		10	1.5169	40	0	1.7850
	20	1.0463		24	1.2440		55	1.3639		20	1.5200		30	1.7900
	30	1.0565		27	1.2456	14	0	1.3667		30	1.5240	41	0	1.7949
	40	1.0666		30	1.2479		5	1.3690		40	1.5270		30	1.7990
	50	1.0760		33	1.2500		10	1.3709		50	1.5301	42	0	1.8030
7	0	1.0854	10	36	1.2516	14	15	1.3737	21	0	1.5340	42	30	1.8071
	10	1.0944		39	1.2536		20	1.3760		10	1.5371	43	0	1.8114
	20	1.1035		42	1.2552		25	1.3781		20	1.5400		30	1.8150
	30	1.1121		45	1.2570		30	1.3805		30	1.5430	44	0	1.8190
	35	1.1170		48	1.2592		35	1.3832		40	1.5461		30	1.8229
	40	1.1210		51	1.2612		40	1.3854		50	1.5497	45	0	1.8270
7	45	1.1253	10	54	1.2631	14	45	1.3878	22	0	1.5526	46		1.8339
	48	1.1274		57	1.2651		50	1.3900		10	1.5558	47		1.8410
	51	1.1306	11	0	1.2668		55	1.3926		20	1.5588	48		1.8480
	54	1.1328		3	1.2684	15	0	1.3949		30	1.5618	49		1.8550
	57	1.1354		6	1.2702		5	1.3970		40	1.5647	50		1.8610
8	0	1.1380		9	1.2723		10	1.3995		50	1.5675	51		1.8678
8	3	1.1403	11	12	1.2740	15	15	1.4018	23	0	1.5705	52		1.8734
	6	1.1425		15	1.2763		20	1.4042		10	1.5738	53		1.8796
	9	1.1449		18	1.2780		25	1.4063		20	1.5767	54		1.8849
	12	1.1480		21	1.2796		30	1.4080		30	1.5794	55		1.8900
	15	1.1500		24	1.2814		35	1.4107		40	1.5822	56		1.8956
	18	1.1526		27	1.2834		40	1.4130		50	1.5850	57		1.9001

8	21	1.1547	11	30	1.2852	15	45	1.4150	24	0	1.5880	58	1.9050
	24	1.1572		33	1.2870		50	1.4170		10	1.5907	59	1.9100
	27	1.1595		36	1.2890		55	1.4194		20	1.5938	60	1.9140
	30	1.1618		39	1.2904	16	0	1.4216		30	1.5965	61	1.9180
	33	1.1644		42	1.2919		5	1.4240		40	1.5991	62	1.9225
	36	1.1664		45	1.2943		10	1.4260		50	1.6015	63	1.9269
8	39	1.1690	11	48	1.2960	16	15	1.4280	25	0	1.6046	64	1.9301
	42	1.1714		51	1.2974		20	1.4301		20	1.6096	65	1.9332
	45	1.1740		54	1.2990		25	1.4324		40	1.6150	66	1.9369
	48	1.1760		57	1.3010		30	1.4342	26	0	1.6200	67	1.9404
	51	1.1785	12	0	1.3028		35	1.4365		20	1.6250	68	1.9438
	54	1.1809		3	1.3040		40	1.4382		40	1.6300	69	1.9470
8	57	1.1828	12	6	1.3060	16	45	1.4404	27	0	1.6352	70	1.9500
9	0	1.1850		9	1.3078		50	1.4425		20	1.6401	71	1.9530
	3	1.1873		12	1.3094		55	1.4446		40	1.6450	72	1.9550
	6	1.1891		15	1.3110	17	0	1.4468	28	0	1.6500	73	1.9580
	9	1.1918		18	1.3129		5	1.4488		20	1.6544	74	1.9601
	12	1.1940		21	1.3142		10	1.4507		40	1.6590	75	1.9624
9	15	1.1960	12	24	1.3162	17	15	1.4527	29	0	1.6635	76	1.9640
	18	1.1984		27	1.3180		20	1.4542		30	1.6700	77	1.9660
	21	1.2004		30	1.3196		25	1.4567	30	0	1.6770	78	1.9672
	24	1.2024		33	1.3210		30	1.4588		30	1.6830	79	1.9691
	27	1.2050		36	1.3230		35	1.4607	31	0	1.6898	80	1.9705
	30	1.2069		39	1.3244		40	1.4629		30	1.6960	81	1.9714
9	33	1.2092	12	42	1.3261	17	45	1.4648	32	0	1.7020	82	1.9721
	36	1.2110		45	1.3273		50	1.4670		30	1.7080	83	1.9730
	39	1.2130		48	1.3290		55	1.4685	33	0	1.7143	84	1.9734
	42	1.2154		51	1.3305	18	0	1.4700		30	1.7200	85	1.9738
	45	1.2176		54	1.3320		10	1.4740	34	0	1.7260	86	1.9740
	48	1.2194		57	1.3340		20	1.4780		30	1.7310	87	1.9740
9	5[illegible]	1.2216	13	0	1.3352	18	30	1.4815	35	0	1.7360	88	1.9742
	51	1.2240		5	1.3380		40	1.4850		30	1.7415	89	1.9742
	5[illegible]	1.2261		10	1.3405		50	1.4886	36	0	1.7462	90	1.9742

TABLE III.—LOGARITHMS.

Sun's App. Alt. °	′	Log.	Sun's App. Alt. °	′	Log.	Sun's App. Alt. °	′	Log.	Sun's App. Alt. °	′	Log.	Sun's App. Alt. °	′	Log.
5	0	0.9645	10	0	1.2395	13	15	1.3590	19	0	1.5149	36	30	1.7934
	10	0.9765		3	1.2420		20	1.3618		10	1.5185	37	0	1.7990
	20	0.9881		6	1.2440		25	1.3644		20	1.5223		30	1.8042
	30	1.0000		9	1.2460		30	1.3672		30	1.5260	38	0	1.8100
	40	1.0112		12	1.2480		35	1.3700		40	1.5300		30	1.8152
	50	1.0222		15	1.2500		40	1.3724		50	1.5334	39	0	1.8208
6	0	1.0331	10	18	1.2520	13	45	1.3750	20	0	1.5370	39	30	1.8260
	10	1.0436		21	1.2542		50	1.3775		10	1.5406	40	0	1.8306
	20	1.0540		24	1.2561		55	1.3800		20	1.5442		30	1.8360
	30	1.0640		27	1.2581	14	0	1.3826		30	1.5480	41	0	1.8404
	40	1.0741		30	1.2603		5	1.3851		40	1.5516		30	1.8452
	50	1.0841		33	1.2621		10	1.3880		50	1.5551	42	0	1.8500
7	0	1.0936	10	36	1.2641	14	15	1.3902	21	0	1.5582	42	30	1.8543
	10	1.1030		39	1.2660		20	1.3930		10	1.5620	43	0	1.8591
	20	1.1120		42	1.2681		25	1.3954		20	1.5652		30	1.8640
	30	1.1210		45	1.2700		30	1.3980		30	1.5682	44	0	1.8683
	35	1.1260		48	1.2720		35	1.4005		40	1.5720		30	1.8725
	40	1.1300		51	1.2740		40	1.4030		50	1.5750	45	0	1.8770
7	45	1.1344	10	54	1.2760	14	45	1.4051	22	0	1.5782	46		1.8848
	48	1.1370		57	1.2781		50	1.4080		10	1.5815	47		1.8930
	51	1.1399	11	0	1.2799		55	1.4100		20	1.5850	48		1.9002
	54	1.1420		3	1.2820	15	0	1.4124		30	1.5880	49		1.9080
	57	1.1450		6	1.2840		5	1.4150		40	1.5914	50		1.9152
8	0	1.1475		9	1.2854		10	1.4170		50	1.5941	51		1.9221
8	3	1.1499	11	12	1.2875	15	15	1.4199	23	0	1.5972	52		1.9296
	6	1.1524		15	1.2892		20	1.4222		10	1.6006	53		1.9360
	9	1.1551		18	1.2912		25	1.4245		20	1.6040	54		1.9424
	12	1.1572		21	1.2930		30	1.4265		30	1.6070	55		1.9482
	15	1.1599		24	1.2950		35	1.4290		40	1.6100	56		1.9542
	18	1.1622		27	1.2971		40	1.4311		50	1.6130	57		1.9602

8	21	1.1650	11	30	1.2990	15	45	1.4335	24	0	1.6160	58	0	1.9660
	24	1.1670		33	1.3006		50	1.4360		10	1.6190	59		1.9715
	27	1.1700		36	1.3024		55	1.4380		20	1.6220	60		1.9761
	30	1 1720		39	1.3040	16	0	1.4404		30	1.6250	61		1.9806
	33	1.1745		42	1.3060		5	1.4430		40	1.6280	62		1.9852
	36	1.1771		45	1.3080		10	1.4450		50	1.6306	63		1.9901
8	39	1.1795	11	48	1.3100	16	15	1.4470	25	0	1.6333	64		1.9944
	42	1.1818		51	1.3117		20	1.4492		20	1.6390	65		1.9984
	45	1.1840		54	1.3130		25	1.4516		40	1.6450	66		2.0024
	48	1.1864		57	1.3150		30	1.4540	26	0	1.6503	67		2.0062
	51	1.1889	12	0	1.3170		35	1.4560		20	1.6559	68		2.0100
	54	1.1910		3	1.3190		40	1.4580		40	1.6610	69		2.0135
8	57	1.1934	12	6	1.3204	16	45	1.4600	27	0	1.6662	70		2.0170
9	0	1.1960		9	1.3225		50	1.4622		20	1.6720	71		2.0206
	3	1.1980		12	1.3240		55	1.4644		40	1.6770	72		2.0240
	6	1.2001		15	1.3258	17	0	1.4668	28	0	1.6822	73		2.0270
	9	1.2025		18	1.3271		5	1.4690		20	1.6872	74		2.0298
	12	1.2050		21	1.3290		10	1.4708		40	1.6923	75		2.0320
9	15	1.2070	12	24	1.3307	17	15	1.4730	29	0	1.6970	76	0	2.0340
	18	1.2091		27	1.3327		20	1.4750		30	1.7043	77		2.0361
	21	1.2114		30	1.3343		25	1.4770	30	0	1.7115	78		2.0380
	24	1.2140		33	1.3361		30	1.4793		30	1.7190	79		2.0400
	27	1.2160		36	1.3380		35	1.4815	31	0	1.7251	80		2.0416
	30	1.2181		39	1.3396		40	1.4835		30	1.7320	81		2.0430
9	33	1.2205	12	42	1.3411	17	45	1.4855	32	0	1.7385	82		2.0444
	36	1.2227		45	1.3430		50	1.4876		30	1.7452	83		2.0451
	39	1.2250		48	1,3446		55	1.4899	33	0	1.7520	84		2.0454
	42	1.2271		51	1.3460	18	0	1.4915		30	1.7580	85		2.0458
	45	1 2290		54	1.3480		10	1.4956	34	0	1.7640	86		2.0460
	48	1.2314		57	1.3492		20	1.4991		30	1.7700	87		2.0461
9	51	1.2332	13	0	1.3510	18	30	1.5035	35	0	1.7761	88		2.0462
	54	1.2352		5	1.3540		40	1.5070		30	1.7820	89		2.0462
	57	1.2375		10	1.3567		50	1.5110	36	0	1.7880	90		2.0462

Correction of Star's Altitude on Refraction of the heavenly bodies.

Ap. Alt.	Ref.	Ap. Alt.	Ref.	Ap. Alt.	Ref.	Ap. Alt.	Ref.	Ap. Alt.	Ref.	Ap. Alt.	Ref.
0	33 0	4 10	11 29	8 20	6 15	15 0	3 30	23 20	2 13	39 0	1 10
5	32 10	4 15	11 18	8 25	6 11	15 10	3 28	23 30	2 11	39 30	1 9
10	31 22	4 20	11 8	8 30	6 8	15 20	3 26	23 40	2 10	40 0	1 8
15	30 36	4 25	10 58	8 35	6 5	15 30	3 24	23 50	2 9	41 0	1 5
20	29 50	4 30	10 48	8 40	6 1	15 40	3 21	24 0	2 8	42 0	1 3
25	29 06	4 35	10 39	8 45	5 58	15 50	3 19	24 10	2 7	43 0	1 1
30	28 23	4 40	10 29	8 50	5 55	16 0	3 17	24 20	2 6	44 0	0 59
35	27 41	4 45	10 20	8 55	5 52	16 10	3 15	24 30	2 5	45 0	0 57
40	27 0	4 50	10 11	9 0	5 48	16 20	3 12	24 40	2 4	46 0	0 55
45	26 20	4 55	10 2	9 5	5 45	16 30	3 10	24 50	2 3	47 0	0 53
50	25 42	5 0	9 54	9 10	5 42	16 40	3 8	25 0	2 2	48 0	0 51
55	25 5	5 5	9 46	9 15	5 39	16 50	3 6	25 10	2 1	49 0	0 49
1 0	24 29	5 10	9 38	9 20	5 36	17 0	3 4	25 20	2 0	50 0	0 48
1 5	23 54	5 15	9 30	9 25	5 34	17 10	3 3	25 30	1 59	51 0	0 46
1 10	23 20	5 20	9 23	9 30	5 31	17 20	3 1	25 40	1 58	52 0	0 44
1 15	22 47	5 25	9 15	9 35	5 28	17 30	2 59	25 50	1 57	53 0	0 43
1 20	22 15	5 30	9 8	9 40	5 25	17 40	2 57	26 0	1 56	54 0	0 41
1 25	21 44	5 35	9 1	9 45	5 23	17 50	2 55	26 10	1 55	55 0	0 40
1 30	21 15	5 40	8 54	9 50	5 20	18 0	2 54	26 20	1 55	56 0	0 38
1 35	20 46	5 45	8 47	9 55	5 18	18 10	2 52	26 30	1 54	57 0	0 37
1 40	20 18	5 50	8 41	10 0	5 15	18 20	2 51	26 40	1 53	58 0	0 35
1 45	19 51	5 55	8 34	10 10	5 10	18 30	2 49	26 50	1 52	59 0	0 34
1 50	19 25	6 0	8 28	10 20	5 5	18 40	2 47	27 0	1 51	60 0	0 33
1 55	19 0	6 5	8 21	10 30	5 0	18 50	2 46	27 15	1 50	61 0	0 32
2 0	18 35	6 10	8 15	10 40	4 56	19 0	2 44	27 30	1 49	62 0	0 30
2 5	18 11	6 15	8 9	10 50	4 51	19 10	2 43	27 45	1 48	63 0	0 29
2 10	17 48	6 20	8 3	11 0	4 47	19 20	2 41	28 0	1 47	64 0	0 28
2 15	17 26	6 25	7 57	11 10	4 43	19 30	2 40	28 15	1 46	65 0	0 26
2 20	17 4	6 30	7 51	11 20	4 39	19 40	2 38	28 30	1 45	66 0	0 25
2 25	16 44	6 35	7 45	11 30	4 34	19 50	2 37	28 45	1 44	67 0	0 24
2 30	16 24	6 40	7 40	11 40	4 31	20 0	2 35	29 0	1 42	68 0	0 23
2 35	16 4	6 45	7 35	11 50	4 27	20 10	2 34	29 30	1 40	69 0	0 22
2 40	15 45	6 50	7 30	12 0	4 23	20 20	2 32	30 0	1 38	70 0	0 21
2 45	15 27	6 55	7 25	12 10	4 20	20 30	2 31	30 30	1 37	71 0	0 19
2 50	15 9	7 0	7 20	12 20	4 16	20 40	2 29	31 0	1 35	72 0	0 18
2 55	14 52	7 5	7 15	12 30	4 13	20 50	2 28	31 30	1 33	73 0	0 17
3 0	14 36	7 10	7 11	12 40	4 9	21 0	2 27	32 0	1 31	74 0	0 16
3 5	14 20	7 15	7 6	12 50	4 6	21 10	2 26	32 30	1 30	75 0	0 15
3 10	14 4	7 20	7 2	13 0	4 3	21 20	2 25	33 0	1 28	76 0	0 14
3 15	13 49	7 25	6 57	13 10	4 0	21 30	2 24	33 30	1 26	77 0	0 13
3 20	13 34	7 30	6 53	13 20	3 57	21 40	2 23	34 0	1 24	78 0	0 12
3 25	13 20	7 35	6 49	13 30	3 54	21 50	2 21	34 30	1 23	79 0	0 11
3 30	13 6	7 40	6 45	13 40	3 51	22 0	2 20	35 0	1 22	80 0	0 10
3 35	12 53	7 45	6 41	13 50	3 48	22 10	2 19	35 30	1 21	81 0	0 9
3 40	12 40	7 50	6 37	14 0	3 45	22 20	2 18	36 0	1 20	82 0	0 8
3 45	12 27	7 55	6 33	14 10	3 43	22 30	2 17	36 30	1 18	83 0	0 7
3 50	12 15	8 0	6 29	14 20	3 40	22 40	2 16	37 0	1 17	84 0	0 6
3 55	12 3	8 5	6 25	14 30	3 38	22 50	2 15	37 30	1 15	86 0	0 4
4 0	11 51	8 10	6 22	14 40	3 35	23 0	2 14	38 0	1 13	88 0	0 2
4 5	11 40	8 15	6 18	14 50	3 33	23 10	2 13	38 30	1 11	90 0	0 0

Correction of Sun's Altitude.

Ap. Alt.	Cor.	Ap. Alt.	Cor.	Ap. Alt.	Cor.	Ap. Alt.	Cor.	Ap. Alt.	Cor.	Ap. Alt.	Cor.
5 0	9 45	8 20	6 6	13 20	3 48	20 0	2 27	26 40	1 46	48 0	0 44
5 5	9 37	8 25	6 2	13 30	3 45	20 10	2 26	26 50	1 45	49 0	0 42
5 10	9 29	8 30	5 59	13 40	3 42	20 20	2 24	27 0	1 44	50 0	0 41
5 15	9 21	8 35	5 56	13 50	3 39	20 30	2 23	27 15	1 43	51 0	0 39
5 20	9 14	8 40	5 52	14 0	3 36	20 40	2 21	27 30	1 42	52 0	0 37
5 25	9 6	8 45	5 49	14 10	3 34	20 50	2 20	27 45	1 41	53 0	0 36
5 30	8 59	8 50	5 46	14 20	3 31	21 0	2 19	28 0	1 39	54 0	0 34
5 35	8 52	8 55	5 43	14 30	3 29	21 10	2 18	28 15	1 38	55 0	0 33
5 40	8 45	9 0	5 39	14 40	3 26	21 20	2 17	28 30	1 37	56 0	0 32
5 45	8 38	9 5	5 36	14 50	3 24	21 30	2 16	28 45	1 36	57 0	0 31
5 50	8 32	9 10	5 33	15 0	3 21	21 40	2 15	29 0	1 34	58 0	0 29
5 55	8 25	9 15	5 30	15 10	3 19	21 50	2 14	29 30	1 32	59 0	0 28
6 0	8 19	9 20	5 27	15 20	3 17	22 0	2 13	30 0	1 30	60 0	0 27
6 5	8 12	9 25	5 25	15 30	3 15	22 10	2 12	30 30	1 29	61 0	0 26
6 10	8 6	9 30	5 22	15 40	3 12	22 20	2 11	31 0	1 27	62 0	0 25
6 15	8 0	9 35	5 19	15 50	3 10	22 30	2 10	31 30	1 25	63 0	0 24
6 20	7 54	9 40	5 16	16 0	3 8	22 40	2 9	32 0	1 23	64 0	0 23
6 25	7 48	9 45	5 14	16 10	3 6	22 50	2 8	32 30	1 22	65 0	0 22
6 30	7 42	9 50	5 11	16 20	3 3	23 0	2 7	33 0	1 21	66 0	0 21
6 35	7 36	9 55	5 9	16 30	3 1	23 10	2 6	33 30	1 18	67 0	0 20
6 40	7 31	10 0	5 6	16 40	2 59	23 20	2 6	34 0	1 16	68 0	0 19
6 45	7 26	10 10	5 1	16 50	2 57	23 30	2 4	34 30	1 15	69 0	0 18
6 50	7 21	10 20	4 56	17 0	2 55	23 40	2 3	35 0	1 14	70 0	0 17
6 55	7 16	10 30	4 51	17 10	2 54	23 50	2 2	35 30	1 13	71 0	0 16
7 0	7 11	10 40	4 47	17 20	2 52	24 0	2 1	36 0	1 12	72 0	0 15
7 5	7 6	10 50	4 42	17 30	2 50	24 10	2 0	36 30	1 10	73 0	0 14
7 10	7 2	11 0	4 38	17 40	2 48	24 20	1 59	37 0	1 9	74 0	0 13
7 15	6 57	11 10	4 34	17 50	2 46	24 30	1 58	37 30	1 7	75 0	0 12
7 20	6 53	11 20	4 30	18 0	2 45	24 40	1 57	38 0	1 5	76 0	0 11
7 25	6 48	11 30	4 25	18 10	2 43	24 50	1 56	38 30	1 3	77 0	0 10
7 30	6 44	11 40	4 22	18 20	2 42	25 0	1 55	39 0	1 2	78 0	0 9
7 35	6 40	11 50	4 18	18 30	2 40	25 10	1 54	39 30	1 1	79 0	0 8
7 40	6 36	12 0	4 14	18 40	2 38	25 20	1 53	40 0	1 0	80 0	0 7
7 45	6 32	12 10	4 11	18 50	2 37	25 30	1 52	41 0	0 58	81 0	0 6
7 50	6 28	12 20	4 7	19 0	2 35	25 40	1 51	42 0	0 56	82 0	0 5
7 55	6 24	12 30	4 4	19 10	2 33	25 50	1 50	43 0	0 54	83 0	0 4
8 0	6 20	12 40	4 0	19 20	2 32	26 0	1 49	44 0	0 52	84 0	0 3
8 5	6 16	12 50	3 57	19 30	2 31	26 10	1 48	45 0	0 50	86 0	0 2
8 10	6 13	13 0	3 54	19 40	2 30	26 20	1 48	46 0	0 48	88 0	0 1
8 15	6 9	13 10	3 51	19 50	2 29	26 30	1 47	47 0	0 46	90 0	0

TABLE VI.

Correction of the Moon's Apparent Altitude, to be used with the preceding method of clearing the distance of effects of Parallax and Refraction.

Moon's Ap. Alt.		HORIZONTAL PARALLAX.															
		54′		55′		56′		57′		58′		59′		60′		61′	
°	′	′	″	′	″	′	″	′	″	′	″	′	″	′	″	′	″
5	0	43	55	44	54	45	54	46	54	47	54	48	54	49	53	50	53
	10	44	10	45	10	46	10	47	9	48	9	49	9	50	9	51	8
	20	44	25	45	24	46	24	47	24	48	24	49	23	50	23	51	23
	30	44	38	45	38	46	38	47	38	48	37	49	37	50	37	51	36
	40	44	51	45	51	46	51	47	51	48	50	49	50	50	50	51	49
	50	45	4	46	3	47	3	48	3	49	3	50	2	51	2	52	2
6	0	45	16	46	15	47	15	48	15	49	14	50	14	51	14	52	13
	10	45	27	46	26	47	26	48	26	49	25	50	25	51	25	52	24
	20	45	37	46	37	47	37	48	36	49	36	50	35	51	35	52	35
	30	45	47	46	47	47	47	48	46	49	46	50	45	51	45	52	45
	40	45	57	46	57	47	56	48	56	49	55	50	55	51	55	52	54
	50	46	6	47	6	48	5	49	5	50	4	51	4	52	4	53	3
7	0	46	15	47	14	48	14	49	13	50	13	51	13	52	12	53	12
	10	46	23	47	23	48	22	49	22	50	21	51	21	52	20	53	20
	20	46	31	47	30	48	30	49	29	50	29	51	28	52	28	53	27
	30	46	38	47	38	48	37	49	37	50	36	51	36	52	35	53	35
	40	46	45	47	45	48	44	49	44	50	43	51	43	52	42	53	42
	50	46	52	47	52	48	51	49	51	50	50	51	49	52	49	53	48
8	0	46	59	47	58	48	58	49	57	50	56	51	56	52	55	53	55
	10	47	5	48	4	49	4	50	3	51	2	52	2	53	1	54	1
	20	47	11	48	10	49	9	50	9	51	8	52	8	53	7	54	6
	30	47	16	48	16	49	15	50	14	51	14	52	13	53	12	54	12
	40	47	22	48	21	49	20	50	20	51	19	52	18	53	17	54	17
	50	47	27	48	26	49	25	50	25	51	24	52	23	53	22	54	22
9	0	47	31	48	31	49	30	50	29	51	29	52	28	53	27	54	26
	10	47	36	48	35	49	35	50	34	51	33	52	32	53	31	54	31
	20	47	40	48	40	49	39	50	38	51	37	52	36	53	36	54	35
	30	47	45	48	44	49	43	50	42	51	41	52	40	53	40	54	39
	40	47	48	48	47	49	47	50	46	51	45	52	44	53	43	54	43
	50	47	52	48	51	49	50	50	50	51	49	52	48	53	47	54	46

TABLE B.

Proportional parts for Minutes of Altitude, add.

Moon's Altitude.	1′	2′	3′	4′	5′	6′	7′	8′	9′
5°	1″	3″	4″	5″	7″	8″	10″	11″	12″
6	1	2	3	4	5	6	7	8	9
7	1	1	2	3	4	4	5	6	7
8	1	1	2	2	3	3	4	5	5
9	0	1	1	2	2	2	3	3	3

In the above Table, the nearest degree of Moon's Apparent Altitude under the odd Minutes at the top, will be the Seconds to be added to the correction of the Moon's Altitude.

TABLE C:

Proportional parts for Seconds of Parallax.

	″ 0	″ 1	″ 2	″ 3	″ 4	″ 5	″ 6	″ 7	″ 8	″ 9
″	″	″	″	″	″	″	″	″	″	″
0	0	1	2	3	4	5	6	7	8	9
10	10	11	12	13	14	15	15	16	17	18
20	19	20	21	22	23	24	25	26	27	28
30	29	30	31	32	33	34	35	36	37	38
40	39	40	41	42	43	44	45	46	46	47
50	49	50	51	52	53	54	55	56	57	58

In the above Table find the tenths of Seconds in the left hand side column, and under the units at the top, in the angle of meeting will be the number of Seconds to be added to the number in Table VI, corresponding to the Moon's Horizontal Parallax and Apparent Altitude, will give the Correction of the Moon's Altitude.

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax.															
		54′		55′		56′		57′		58′		59′		60′		61′	
10°	0	47′	56″	48′	55″	49′	54″	50′	53″	51′	52″	52′	51″	53′	50″	54′	49″
	10	47	59	48	58	49	57	50	56	51	55	52	54	53	53	54	52
	20	48	2	49	1	50	0	50	59	51	58	52	57	53	56	54	56
	30	48	5	49	4	50	3	51	2	52	1	53	0	53	59	54	58
	40	48	8	49	7	50	6	51	5	52	4	53	3	54	2	55	1
	50	48	11	49	10	50	9	51	8	52	7	53	6	54	4	55	3
11°	0	48	13	49	12	50	11	51	10	52	9	53	8	54	7	55	6
	10	48	16	49	15	50	14	51	12	52	11	53	10	54	9	55	8
	20	48	18	49	17	50	16	51	15	52	13	53	12	54	11	55	10
	30	48	20	49	19	50	18	51	17	52	15	53	14	54	13	55	12
	40	48	22	49	21	50	20	51	19	52	17	53	16	54	15	55	14
	50	48	24	49	23	50	22	51	20	52	19	53	18	54	16	55	15
12°	0	48	26	49	25	50	23	51	22	52	21	53	19	54	18	55	17
	10	48	27	49	26	50	25	51	23	52	22	53	21	54	19	55	18
	20	48	29	49	28	50	26	51	25	52	23	53	22	54	21	55	19
	30	48	30	49	29	50	27	51	26	52	25	53	23	54	22	55	20
	40	48	32	49	30	50	29	51	27	52	26	53	24	54	23	55	21
	50	48	33	49	31	50	30	51	28	52	27	53	25	54	24	55	22
13°	0	48	34	49	32	50	31	51	29	52	28	53	26	54	25	55	23
	10	48	35	49	33	50	32	51	30	52	28	53	27	54	25	55	24
	20	48	36	49	34	50	32	51	31	52	29	53	28	54	26	55	24
	30	48	36	49	35	50	33	51	31	52	30	53	28	54	26	55	25
	40	48	37	49	35	50	34	51	32	52	30	53	29	54	27	55	25
	50	48	38	49	36	50	34	51	32	52	31	53	29	54	27	55	25
14°	0	48	38	49	36	50	35	51	33	52	31	53	29	54	27	55	26
	10	48	39	49	37	50	35	51	33	52	31	53	29	54	28	55	26
	20	48	39	49	37	50	35	51	33	52	31	53	29	54	28	55	26
	30	48	39	49	37	50	35	51	33	52	31	53	29	54	28	55	26
	40	48	39	49	37	50	35	51	33	52	31	53	29	54	28	55	26
	50	48	39	49	37	50	35	51	33	52	31	53	29	54	27	55	25

TABLE C.

Proportional part for Seconds of Parallax.

″	″ 0	″ 1	″ 2	″ 3	″ 4	″ 5	″ 6	″ 7	″ 8	″ 9
0	0	1	2	3	4	5	6	7	8	9
10	10	11	12	13	14	15	15	16	17	18
20	19	20	21	23	23	24	25	26	27	28
30	29	30	31	32	33	34	35	36	37	38
40	39	40	41	42	43	44	45	46	46	47
50	48	49	50	51	52	53	54	55	56	57

In this page the proportion for parts of minutes of Altitude may be neglected, not being scarcely a second either way.

Therefore no proportions have been given at the bottom of this page, as in the other pages.

15°	0	48	39	49	37	50	35	51	33	52	31	53	29	54	27	55	25
	10	48	39	49	37	50	35	51	33	52	31	53	29	54	27	55	25
	20	48	39	49	37	50	35	51	33	52	31	53	28	54	26	55	24
	30	48	39	49	37	50	34	51	32	52	30	53	28	54	26	55	24
	40	48	39	49	36	50	34	51	32	52	30	53	27	54	25	55	23
	50	48	38	49	36	50	34	51	31	52	29	53	27	54	24	55	22
16°	0	48	38	49	35	50	33	51	31	52	28	53	26	54	24	55	21
	10	48	37	49	35	50	32	51	30	52	28	53	25	54	23	55	21
	20	48	37	49	34	50	32	51	29	52	27	53	25	54	22	55	20
	30	48	36	49	33	50	31	51	29	52	26	53	24	54	21	55	19
	40	48	35	49	33	50	30	51	28	52	25	53	23	54	20	55	18
	50	48	34	49	32	50	29	51	27	52	24	53	22	54	19	55	16
17°	0	48	34	49	31	50	28	51	26	52	23	53	21	54	18	55	15
	10	48	33	49	30	50	27	51	25	52	22	53	19	54	17	55	14
	20	48	32	49	29	50	26	51	24	52	21	53	18	54	15	55	13
	30	48	31	49	28	50	25	51	22	52	20	53	17	54	14	55	11
	40	48	30	49	27	50	24	51	21	52	18	53	16	54	13	55	10
	50	48	29	49	26	50	23	51	20	52	17	53	14	54	11	55	8
18°	0	48	27	49	24	50	22	51	19	52	16	53	13	54	10	55	7
	10	48	26	49	23	50	20	51	17	52	14	53	11	54	8	55	5
	20	48	25	49	22	50	19	51	16	52	13	53	10	54	7	55	4
	30	48	23	49	20	50	17	51	14	52	11	53	8	54	5	55	2
	40	48	22	49	19	50	16	51	13	52	9	53	6	54	3	55	0
	50	48	21	49	17	50	14	51	11	52	8	53	5	54	1	54	58
19°	0	48	19	49	16	50	13	51	9	52	6	53	3	54	0	54	56
	10	48	18	49	14	50	11	51	8	52	4	53	1	53	58	54	54
	20	48	16	49	13	50	9	51	6	52	2	52	59	53	56	54	52
	30	48	14	49	11	50	7	51	4	52	1	52	57	53	54	54	50
	40	48	13	49	9	50	6	51	2	51	59	52	55	53	52	54	48
	50	48	11	49	7	50	4	51	0	51	57	52	53	53	49	54	46

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax.															
		54′		55′		56′		57′		58′		59′		60′		61′	
20°	0	48′	9″	49′	5″	50′	2″	50′	58″	51′	55″	52′	51″	53′	47″	54′	44″
	10	48	7	49	3	50	0	50	56	51	52	52	49	53	45	54	41
	20	48	5	49	1	49	58	50	54	51	50	52	46	53	43	54	39
	30	48	3	48	59	49	56	50	52	51	48	52	44	53	40	54	37
	40	48	1	48	57	49	53	50	50	51	46	52	42	53	38	54	34
	50	47	59	48	55	49	51	50	47	51	44	52	40	53	36	54	32
21°	0	47	57	48	53	49	49	50	45	51	41	52	37	53	33	54	29
	10	47	55	48	51	49	47	50	43	51	39	52	35	53	31	54	27
	20	47	53	48	49	49	45	50	40	51	36	52	32	53	28	54	24
	30	47	51	48	46	49	42	50	38	51	34	52	30	53	26	54	21
	40	47	48	48	44	49	40	50	36	51	31	52	27	53	23	54	19
	50	47	46	48	42	49	37	50	33	51	29	52	25	53	20	54	16
22°	0	47	44	48	39	49	35	50	31	51	26	52	22	53	18	54	13
	10	47	41	48	37	49	32	50	28	51	24	52	19	53	15	54	10
	20	47	39	48	34	49	30	50	25	51	21	52	16	53	12	54	7
	30	47	36	48	32	49	27	50	23	51	18	52	14	53	9	54	4
	40	47	34	48	29	49	25	50	20	51	15	52	11	53	6	54	1
	50	47	31	48	27	49	22	50	17	51	13	52	8	53	3	53	58
23°	0	47	29	48	24	49	19	50	14	51	10	52	5	53	0	53	55
	10	47	26	48	21	49	16	50	12	51	7	52	2	52	57	53	52
	20	47	23	48	19	49	14	50	9	51	4	51	59	52	54	53	49
	30	47	21	48	16	49	11	50	6	51	1	51	56	52	51	53	46
	40	47	18	48	13	49	8	50	3	50	58	51	53	52	48	53	43
	50	47	15	48	10	49	5	50	0	50	55	51	50	52	44	53	39
24°	0	47	12	48	7	49	2	49	57	50	52	51	47	52	41	53	36
	10	47	10	48	4	48	59	49	54	50	48	51	43	52	38	53	33
	20	47	7	48	1	48	56	49	51	50	45	51	40	52	35	53	29
	30	47	4	47	58	48	53	49	47	50	42	51	37	52	31	53	26
	40	47	1	47	55	48	50	49	44	50	39	51	33	52	28	53	22
	50	46	58	47	52	48	47	49	41	50	35	51	30	52	24	53	19

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	1	2	3	4	5	5	6	7	8
10	9	10	11	12	13	14	15	15	16	17
20	18	19	20	21	22	23	24	25	25	26
30	27	28	29	30	31	32	33	34	35	35
40	36	37	38	39	40	41	42	43	44	45
50	46	46	47	48	49	50	51	53	53	54

25°	0	46 55	47 49	48 43	49 38	50 32	51 27	52 21	53 15
	10	46 52	47 46	48 40	49 34	50 29	51 23	52 17	53 12
	20	46 48	47 43	48 37	49 31	50 25	51 20	52 14	53 8
	30	46 45	47 39	48 34	49 28	50 22	51 16	52 10	53 4
	40	46 42	47 36	48 30	49 24	50 18	51 13	52 7	53 1
	50	46 39	47 33	48 27	49 21	50 15	51 9	52 3	52 57
26°	0	46 36	47 30	48 23	49 17	50 11	51 5	51 59	52 53
	10	46 32	47 26	48 20	49 14	50 8	51 2	51 55	52 49
	20	46 29	47 23	48 17	49 10	50 4	50 58	51 52	52 45
	30	46 26	47 19	48 13	49 7	50 0	50 54	51 48	52 41
	40	46 22	47 16	48 9	49 3	49 57	50 50	51 44	52 38
	50	46 19	47 12	48 6	48 59	49 53	50 46	51 40	52 34
27°	0	46 15	47 9	48 2	48 56	49 49	50 43	51 36	52 30
	10	46 12	47 5	47 59	48 52	49 45	50 39	51 32	52 26
	20	46 8	47 2	47 55	48 48	49 42	50 35	51 28	52 21
	30	46 5	46 58	47 51	48 44	49 39	50 31	51 24	52 17
	40	46 1	46 54	47 47	48 40	49 34	50 27	51 20	52 13
	50	45 58	46 51	47 44	48 37	49 30	50 23	51 16	52 9
28°	0	45 54	46 47	47 40	48 33	49 26	50 19	51 12	52 5
	10	45 50	46 43	47 36	48 29	49 22	50 15	51 8	52 0
	20	45 46	46 39	47 32	48 25	49 17	50 10	51 4	51 56
	30	45 43	46 35	47 28	48 21	49 14	50 6	50 59	51 52
	40	45 39	46 32	47 24	48 17	49 9	50 2	50 55	51 47
	50	45 35	46 28	47 20	48 13	49 5	49 58	50 50	51 43
29°	0	45 31	46 24	47 16	48 9	49 1	49 54	50 46	51 39
	10	45 27	46 20	47 12	48 5	48 57	49 49	50 42	51 34
	20	45 23	46 16	47 8	48 0	48 53	49 45	50 37	51 30
	30	45 19	46 12	47 4	47 56	48 48	49 41	50 33	51 25
	40	45 15	46 8	47 0	47 52	48 44	49 36	50 28	51 20
	50	45 12	46 4	46 56	47 48	48 40	49 32	50 24	51 16

Proportional parts to Minutes of Altitude. { 1′ 2′ 3′ 4′ 5′ 6′ 7′ 8′ 9′ / 0″ 1″ 1″ 1″ 2″ 2″ 2″ 3″ 3″ } Subtract.

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax.															
		54		55′		56′		57′		58′		59′		60′		61′	
30°	0	45′	7″	45′	59″	46′	51″	47′	43″	48′	35″	49′	27″	50′	19″	51′	11″
	10	45	3	45	55	46	47	47	39	48	31	49	23	50	15	51	7
	20	44	59	45	51	46	43	47	35	48	26	49	18	50	10	51	2
	30	44	55	45	47	46	39	47	30	48	22	49	14	50	5	50	57
	40	44	51	45	43	46	34	47	26	48	17	49	9	50	1	50	52
	50	44	47	45	38	46	30	47	21	48	13	49	4	49	56	50	47
31°	0	44	43	45	34	46	25	47	17	48	8	49	0	49	51	50	43
	10	44	38	45	30	46	21	47	12	48	4	48	55	49	46	50	38
	20	44	34	45	25	46	17	47	8	47	59	48	50	49	42	50	33
	30	44	30	45	21	46	12	47	3	47	54	48	46	49	37	50	28
	40	44	25	45	16	46	8	46	59	47	50	48	41	49	32	50	23
	50	44	21	45	12	46	3	46	54	47	45	48	36	49	27	50	18
32°	0	44	17	45	8	45	58	46	49	47	40	48	31	49	22	50	13
	10	44	12	45	3	45	54	46	45	47	35	48	26	49	17	50	8
	20	44	8	44	58	45	49	46	40	47	31	48	21	49	12	50	3
	30	44	3	44	54	45	45	46	35	47	26	48	16	49	7	49	58
	40	43	59	44	49	45	40	46	30	47	21	48	11	49	2	49	52
	50	43	54	44	45	45	35	46	26	47	16	48	6	48	57	49	47
33°	0	43	50	44	40	45	30	46	21	47	11	48	1	48	52	49	42
	10	43	45	44	35	45	26	46	16	47	6	47	56	48	46	49	37
	20	43	40	44	31	45	21	46	11	47	1	47	51	48	41	49	31
	30	43	36	44	26	45	16	46	6	46	56	47	46	48	36	49	26
	40	43	31	44	21	45	11	46	1	46	51	47	41	48	31	49	21
	50	43	26	44	16	45	6	45	56	46	46	47	36	48	26	49	15
34°	0	43	22	44	12	45	1	45	51	46	41	47	30	48	20	49	10
	10	43	17	44	7	44	56	45	46	46	36	47	25	48	15	49	5
	20	43	12	44	2	44	51	45	41	46	30	47	20	48	9	48	59
	30	43	7	43	57	44	46	45	36	46	25	47	15	48	4	48	54
	40	43	3	43	52	44	41	45	31	46	20	47	9	47	59	48	48
	50	42	58	43	47	44	36	45	25	46	15	47	4	47	53	48	42

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	1	2	2	3	4	5	6	7	7
10	8	9	10	11	12	12	13	14	15	16
20	16	17	18	19	20	21	21	22	23	24
30	25	26	26	27	28	29	30	30	31	32
40	33	34	35	35	36	37	38	39	40	40
50	41	42	43	44	44	45	46	47	48	49

35°	0	42	53	43	42	44	31	45	20	46	9	46	59	47	48	48	37
	10	42	48	43	37	44	26	45	15	46	4	46	53	47	42	48	31
	20	42	43	43	32	44	21	45	10	45	59	46	48	47	37	48	26
	30	42	38	43	27	44	16	45	5	45	53	46	42	47	31	48	20
	40	42	33	43	22	44	10	44	59	45	48	46	37	47	24	48	14
	50	42	28	43	17	44	5	44	54	45	43	46	31	47	20	48	8
36°	0	42	23	43	11	44	0	44	49	45	37	46	26	47	14	48	3
	10	42	18	43	6	43	55	44	43	45	32	46	20	47	8	47	57
	20	42	13	43	1	43	49	44	38	45	26	46	14	47	3	47	51
	30	42	8	42	56	43	44	44	32	45	21	46	9	46	57	47	45
	40	42	2	42	51	43	39	44	27	45	15	46	3	46	51	47	39
	50	41	57	42	45	43	33	44	21	45	9	45	57	46	45	47	33
37°	0	41	52	42	40	43	28	44	16	45	3	45	52	46	40	47	28
	10	41	47	42	35	43	22	44	10	44	58	45	46	46	34	47	22
	20	41	42	42	29	43	17	44	5	44	52	45	40	46	28	47	16
	30	41	36	42	24	43	11	43	59	44	47	45	34	46	22	47	9
	40	41	31	42	18	43	6	43	53	44	41	45	28	46	16	47	3
	50	41	26	42	13	43	0	43	48	44	35	45	23	46	10	46	57
38°	0	41	20	42	8	42	55	43	42	44	29	45	17	46	4	46	51
	10	41	15	42	2	42	49	43	36	44	24	45	11	45	58	46	45
	20	41	10	41	57	42	44	43	31	44	18	45	5	45	52	46	39
	30	41	4	41	51	42	38	43	25	44	12	44	59	45	46	46	33
	40	40	59	41	45	42	32	43	19	44	6	44	53	45	40	46	27
	50	40	53	41	40	42	27	43	13	44	0	44	47	45	34	46	20
39°	0	40	48	41	34	42	21	43	8	43	54	44	41	45	27	46	14
	10	40	41	41	29	42	15	43	2	43	48	44	35	45	21	46	8
	20	40	37	41	23	42	9	42	56	43	42	44	29	45	15	46	1
	30	40	31	41	17	42	4	42	50	43	36	44	22	45	9	45	55
	40	40	25	41	12	41	58	42	44	43	30	44	16	45	3	45	49
	50	40	20	41	6	41	52	42	38	43	24	44	10	44	56	45	42

Proportional parts to Minutes of Altitude.	1′	2′	3′	4′	5′	6′	7′	8′	9′	Subtract.
	1″	1″	2″	2″	3″	3″	4″	4″	5″	

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax. 54′		55′		56′		57′		58′		59′		60′		61′	
40°	0	40′	14″	41′	0″	41′	46″	42′	32″	43′	18″	44′	4″	44′	50″	45′	36″
	10	40	8	40	54	41	40	42	26	43	12	43	58	44	44	45	29
	20	40	3	40	49	41	34	42	20	43	6	43	51	44	37	45	22
	30	39	57	40	43	41	28	42	14	43	0	43	45	44	31	45	16
	40	39	51	40	37	41	22	42	8	42	53	43	39	44	24	45	10
	50	39	46	40	31	41	16	42	2	42	47	43	33	44	18	45	3
41°	0	39	40	40	25	41	10	41	56	42	41	[illegible]	26	44	11	44	57
	10	39	34	40	19	41	4	41	49	42	35	43	20	44	5	44	50
	20	39	28	40	13	40	58	41	43	42	28	43	13	43	58	44	43
	30	39	22	40	7	40	52	41	37	42	22	43	7	43	52	44	37
	40	39	16	40	1	40	46	41	31	42	16	43	1	43	45	44	30
	50	39	10	39	55	40	40	41	25	42	9	42	54	43	39	44	23
42°	0	39	5	39	49	40	34	41	18	42	3	42	47	43	32	44	17
	10	38	59	39	43	40	28	41	12	41	57	42	41	43	25	44	10
	20	38	53	39	37	40	21	41	6	41	50	42	34	43	19	44	3
	30	38	47	39	31	40	15	40	59	41	44	42	28	43	12	43	56
	40	38	41	39	25	40	9	40	53	41	37	42	21	43	5	43	49
	50	38	35	39	19	40	3	40	47	41	31	42	15	42	59	43	43
43°	0	38	29	39	12	39	56	40	40	41	24	42	8	42	52	43	36
	10	38	22	39	6	39	50	40	34	41	18	42	1	42	45	43	29
	20	38	16	39	0	39	44	40	27	41	11	41	55	42	38	43	22
	30	38	10	38	54	39	37	40	21	41	4	41	48	42	31	43	15
	40	38	4	38	47	39	31	40	14	40	58	41	41	42	24	43	8
	50	37	58	38	41	39	24	40	8	40	51	41	34	42	18	43	1
44°	0	37	52	38	35	39	18	40	1	40	44	41	28	42	11	42	54
	10	37	46	38	29	39	12	39	55	40	38	41	21	42	4	42	47
	20	37	39	38	22	39	5	39	48	40	31	41	14	41	57	42	40
	30	37	33	38	16	38	59	39	41	40	24	41	7	41	50	42	33
	40	37	27	38	9	38	52	39	35	40	17	41	0	41	43	42	25
	50	37	20	38	3	38	46	39	28	40	11	40	53	41	36	42	18

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	1	1	2	3	4	4	5	6	6
10	7	8	9	9	10	11	11	12	13	14
20	14	15	16	16	17	18	19	19	20	21
30	21	22	23	24	24	25	26	26	27	28
40	29	29	30	31	31	32	33	34	34	35
50	36	36	37	38	39	39	40	41	41	42

45°	0	37	14	37	57	38	39	39	21	40	4	40	46	41	29	42	11
	10	37	8	37	50	38	32	39	15	39	57	40	39	41	22	42	4
	20	37	1	37	43	38	26	39	8	39	50	40	32	41	14	41	57
	30	36	55	37	37	38	19	39	1	39	43	40	25	41	7	41	49
	40	36	49	37	31	38	12	38	54	39	36	40	18	41	0	41	42
	50	36	42	37	24	38	6	38	48	39	29	40	11	40	53	41	35
46°	0	36	36	37	17	37	59	38	41	39	22	40	4	40	46	41	27
	10	36	29	37	11	37	52	38	34	39	15	39	57	40	39	41	20
	20	36	23	37	4	37	46	38	27	39	8	39	50	40	31	41	13
	30	36	16	36	58	37	39	38	20	39	1	39	43	40	24	41	5
	40	36	10	36	51	37	32	38	13	38	54	39	36	40	17	40	58
	50	36	3	36	44	37	25	38	6	38	47	39	28	40	9	40	50
47°	0	35	57	36	38	37	18	37	59	38	40	39	21	40	2	40	43
	10	35	50	36	31	37	12	37	52	38	33	39	14	39	55	40	36
	20	35	43	36	24	37	5	37	45	38	26	39	7	39	47	40	28
	30	35	37	36	17	36	58	37	38	38	19	38	59	39	40	40	22
	40	35	30	36	10	36	51	37	31	38	12	38	52	39	32	40	13
	50	35	23	36	3	36	44	37	24	38	5	38	45	39	25	40	5
48°	0	35	17	35	57	36	37	37	17	37	57	38	37	39	18	39	58
	10	35	10	35	50	36	30	37	10	37	50	38	30	39	10	39	50
	20	35	3	35	43	36	23	37	3	37	43	38	23	39	3	39	42
	30	34	56	35	36	36	16	36	56	37	36	38	15	38	55	39	35
	40	34	50	35	29	36	9	36	49	37	28	38	8	38	47	39	27
	50	34	43	35	22	36	2	36	41	37	21	38	0	38	40	39	19
49°	0	34	36	35	15	35	55	36	34	37	14	37	53	38	32	39	12
	10	34	29	35	9	35	48	36	27	37	6	37	45	38	25	39	4
	20	34	22	35	2	35	41	36	20	36	59	37	38	38	17	38	56
	30	34	16	34	55	35	34	36	12	36	51	37	30	38	9	38	48
	40	34	9	34	48	35	26	36	5	36	44	37	23	38	2	38	41
	50	34	2	34	39	35	19	35	58	36	37	37	15	37	54	38	33

Proportional parts to Minutes of Altitude. { 2′ 3′ 3′ 4′ 5′ 6′ 7′ 8′ 9′ / 1″ 3″ 3″ 3″ 4″ 4″ 5″ 5″ 6″ } Subtract.

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.	Moon's Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
50° 0	33′ 55″	34′ 33″	35′ 12″	35′ 51″	36′ 29″	37′ 8″	37′ 46″	38′ 25″
10	33 48	34 26	35 5	35 43	36 22	37 0	37 39	38 17
20	33 41	34 19	34 58	35 36	36 14	36 52	37 31	38 9
30	33 34	34 12	34 50	35 28	36 7	36 45	37 23	38 1
40	33 27	34 5	34 43	35 21	35 59	36 37	37 15	37 53
50	33 20	33 58	34 36	35 14	35 52	36 29	37 7	37 45
51° 0	33 13	33 51	34 28	35 6	35 44	36 22	36 59	37 37
10	33 6	33 43	34 21	34 59	35 36	36 14	36 52	37 29
20	32 59	33 36	34 14	34 51	35 29	36 6	36 44	37 21
30	32 52	33 29	34 6	34 44	35 21	35 58	36 36	37 13
40	32 45	33 22	33 59	34 36	35 13	35 50	36 28	37 5
50	32 37	33 14	33 52	34 29	35 6	35 42	36 20	36 57
52° 0	32 30	33 7	33 44	34 21	34 58	35 35	36 12	36 49
10	32 23	33 0	33 37	34 13	34 50	35 27	36 4	36 41
20	32 16	32 53	33 29	34 6	34 43	35 19	35 56	36 33
30	32 9	32 45	33 22	33 58	34 35	35 11	35 48	36 24
40	32 1	32 38	33 14	33 51	34 27	35 3	35 40	36 16
50	31 54	32 30	33 7	33 43	34 19	34 55	35 32	36 8
53° 0	31 47	32 23	32 59	33 35	34 11	34 48	35 24	36 0
10	31 40	32 16	32 52	33 28	34 4	34 40	35 15	35 51
20	31 32	32 8	32 44	33 20	33 56	34 32	35 7	35 43
30	31 25	32 1	32 36	33 12	33 48	34 24	34 59	35 35
40	31 18	31 53	32 29	33 4	33 40	34 15	34 51	35 27
50	31 10	31 46	32 21	32 57	33 32	34 7	34 43	35 18
54° 0	31 3	31 38	32 13	32 49	33 24	33 59	34 35	35 10
10	30 56	31 31	32 6	32 41	33 16	33 51	34 26	35 2
20	30 48	31 23	31 58	32 33	33 8	33 43	34 18	34 53
30	30 41	31 16	31 51	32 25	33 0	33 35	34 10	34 45
40	30 33	31 8	31 43	32 18	32 52	33 27	34 2	34 36
50	30 [illegible]	31 1	31 35	32 10	32 44	33 19	33 53	34 28

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	1	1	2	2	3	3	4	5	5
10	6	6	7	8	8	9	9	10	10	11
20	12	12	13	13	14	15	15	16	16	17
30	17	18	19	19	20	20	21	21	22	23
40	23	24	24	25	26	26	27	27	28	28
50	29	30	30	31	31	32	32	33	34	34

15°	0	48	39	49	37	50	35	51	33	52	31	53	29	54	27	55	25
	10	48	39	49	37	50	35	51	33	52	31	53	29	54	27	55	25
	20	48	39	49	37	50	35	51	33	52	31	53	28	54	26	55	24
	30	48	39	49	37	50	34	51	32	52	30	53	28	54	26	55	24
	40	48	39	49	36	50	34	51	32	52	30	53	27	54	25	55	23
	50	48	38	49	36	50	34	51	31	52	29	53	27	54	24	55	22
16°	0	48	38	49	35	50	33	51	31	52	28	53	26	54	24	55	21
	10	48	37	49	35	50	32	51	30	52	28	53	25	54	23	55	21
	20	48	37	49	34	50	32	51	29	52	27	53	25	54	22	55	20
	30	48	36	49	33	50	31	51	29	52	26	53	24	54	21	55	19
	40	48	35	49	33	50	30	51	28	52	25	53	23	54	20	55	18
	50	48	34	49	32	50	29	51	27	52	24	53	22	54	19	55	16
17°	0	48	34	49	31	50	28	51	26	52	23	53	21	54	18	55	15
	10	48	33	49	30	50	27	51	25	52	22	53	19	54	17	55	14
	20	48	32	49	29	50	26	51	24	52	21	53	18	54	15	55	13
	30	48	31	49	28	50	25	51	22	52	20	53	17	54	14	55	11
	40	48	30	49	27	50	24	51	21	52	18	53	16	54	13	55	10
	50	48	29	49	26	50	23	51	20	52	17	53	14	54	11	55	8
18°	0	48	27	49	24	50	22	51	19	52	16	53	13	54	10	55	7
	10	48	26	49	23	50	20	51	17	52	14	53	11	54	8	55	5
	20	48	25	49	22	50	19	51	16	52	13	53	10	54	7	55	4
	30	48	23	49	20	50	17	51	14	52	11	53	8	54	5	55	2
	40	48	22	49	19	50	16	51	13	52	9	53	6	54	3	55	0
	50	48	21	49	17	50	14	51	11	52	8	53	5	54	1	54	58
19°	0	48	19	49	16	50	13	51	9	52	6	53	3	54	0	54	56
	10	48	18	49	14	50	11	51	8	52	4	53	1	53	58	54	54
	20	48	16	49	13	50	9	51	6	52	2	52	59	53	56	54	52
	30	48	14	49	11	50	7	51	4	52	1	52	57	53	54	54	50
	40	48	13	49	9	50	6	51	2	51	59	52	55	53	52	54	48
	50	48	11	49	7	50	4	51	0	51	57	52	53	53	49	54	46

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax.															
		54′		55′		56′		57′		58′		59′		60′		61′	
60°	0	26′	27″	26′	57″	27′	27″	27′	57″	28′	27″	28′	57″	29′	27″	29′	57″
	10	26	19	26	49	27	19	27	49	28	19	28	48	29	19	29	48
	20	26	11	26	41	27	11	27	40	28	10	28	40	29	9	29	39
	30	26	3	26	33	27	2	27	32	28	1	28	31	29	0	29	30
	40	25	55	26	25	26	54	27	23	27	53	28	22	28	52	29	21
	50	25	47	26	16	26	46	27	15	27	44	28	13	28	43	29	12
61°	0	25	39	26	8	26	37	27	6	27	36	28	5	28	34	29	3
	10	25	31	26	0	26	29	26	58	27	27	27	56	28	25	28	54
	20	25	23	25	52	26	21	26	49	27	18	27	47	28	16	28	45
	30	25	15	25	44	26	12	26	41	27	10	27	38	28	7	28	35
	40	25	7	25	35	26	4	26	32	27	1	27	29	27	58	28	26
	50	24	59	25	27	25	56	26	24	26	52	27	21	27	49	28	17
62°	0	24	51	25	19	25	47	26	15	26	43	27	12	27	40	28	8
	10	24	43	25	11	25	39	26	7	26	35	27	3	27	31	27	59
	20	24	35	25	2	25	30	25	58	26	26	26	54	27	22	27	50
	30	24	26	24	54	25	22	25	50	26	17	26	45	27	13	27	40
	40	24	18	24	46	25	13	25	41	26	8	26	36	27	4	27	31
	50	24	10	24	37	25	5	25	32	26	0	26	27	26	54	27	22
63°	0	24	2	24	29	24	56	25	25	25	51	26	18	26	45	27	13
	10	23	54	24	21	24	48	25	15	25	42	26	9	26	36	27	3
	20	23	45	24	12	24	39	25	6	25	33	26	0	26	27	26	54
	30	23	37	24	4	24	31	24	58	25	24	25	51	26	18	26	45
	40	23	29	23	56	24	22	24	49	25	15	25	42	26	9	26	35
	50	23	21	23	47	24	14	24	40	25	7	25	33	26	0	26	26
64°	0	23	13	23	39	24	5	24	31	24	58	25	24	25	50	26	17
	10	23	4	23	30	23	57	24	22	24	49	25	15	25	41	26	7
	20	22	56	23	22	23	48	24	14	24	40	25	6	25	32	25	58
	30	22	48	23	14	23	39	24	5	24	31	24	57	25	23	25	48
	40	22	39	23	5	23	31	23	56	24	22	24	48	25	13	25	39
	50	22	31	22	57	23	22	23	48	24	13	24	39	25	4	25	30

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	0	1	1	2	2	3	3	3	4
10	4	5	5	6	6	6	7	7	7	8
20	9	9	9	10	10	11	11	12	12	12
30	13	13	14	14	15	15	15	16	16	17
40	17	18	18	18	19	19	20	20	21	21
50	22	22	22	23	23	24	24	25	25	25

25°	0	46	55	47	49	48	43	49	38	50	32	51	27	52	21	53	15
	10	46	52	47	46	48	40	49	34	50	29	51	23	52	17	53	12
	20	46	48	47	43	48	37	49	31	50	25	51	20	52	14	53	8
	30	46	45	47	39	48	34	49	28	50	22	51	16	52	10	53	4
	40	46	42	47	36	48	30	49	24	50	18	51	13	52	7	53	1
	50	46	39	47	33	48	27	49	21	50	15	51	9	52	3	52	57
26°	0	46	36	47	30	48	23	49	17	50	11	51	5	51	59	52	53
	10	46	32	47	26	48	20	49	14	50	8	51	2	51	55	52	49
	20	46	29	47	23	48	17	49	10	50	4	50	58	51	52	52	45
	30	46	26	47	19	48	13	49	7	50	0	50	54	51	48	52	41
	40	46	22	47	16	48	9	49	3	49	57	50	50	51	44	52	38
	50	46	19	47	12	48	6	48	59	49	53	50	46	51	40	52	34
27°	0	46	15	47	9	48	2	48	56	49	49	50	43	51	36	52	30
	10	46	12	47	5	47	59	48	52	49	45	50	39	51	32	52	26
	20	46	8	47	2	47	55	48	48	49	42	50	35	51	28	52	21
	30	46	5	46	58	47	51	48	44	49	39	50	31	51	24	52	17
	40	46	1	46	54	47	47	48	40	49	34	50	27	51	20	52	13
	50	45	58	46	51	47	44	48	37	49	30	50	23	51	16	52	9
28°	0	45	54	46	47	47	40	48	33	49	26	50	19	51	12	52	5
	10	45	50	46	43	47	36	48	29	49	22	50	15	51	8	52	0
	20	45	46	46	39	47	32	48	25	49	17	50	10	51	4	51	56
	30	45	43	46	35	47	28	48	21	49	14	50	6	50	59	51	52
	40	45	39	46	32	47	24	48	17	49	9	50	2	50	55	51	47
	50	45	35	46	28	47	20	48	13	49	5	49	58	50	50	51	43
29°	0	45	31	46	24	47	16	48	9	49	1	49	54	50	46	51	39
	10	45	27	46	20	47	12	48	5	48	57	49	49	50	42	51	34
	20	45	23	46	16	47	8	48	0	48	53	49	45	50	37	51	30
	30	45	19	46	12	47	4	47	56	48	48	49	41	50	33	51	25
	40	45	15	46	8	47	0	47	52	48	44	49	36	50	28	51	20
	50	45	12	46	4	46	56	47	48	48	40	49	32	50	24	51	16

Proportional parts to Minutes of Altitude.	1′	2′	3′	4′	5′	6′	7′	8′	9′	Subtract.
	0″	1″	1″	1″	2″	2″	2″	3″	3″	

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax.															
		54′		55′		56′		57′		58′		59′		60′		61′	
70°	0	18′	7″	18′	28″	18′	48″	19′	9″	19′	30″	19′	50″	20′	11″	20′	31″
	10	17	59	18	19	18	39	19	0	19	20	19	41	20	1	20	21
	20	17	50	18	10	18	30	18	51	19	11	19	31	19	51	20	11
	30	17	41	18	1	18	21	18	41	19	1	19	22	19	42	20	2
	40	17	33	17	53	18	12	18	32	18	52	19	12	19	32	19	52
	50	17	24	17	44	18	3	18	23	18	43	19	2	19	22	19	42
71°	0	17	15	17	35	17	54	18	14	18	33	18	53	19	12	19	32
	10	17	6	17	26	17	45	18	5	18	24	18	43	19	3	19	22
	20	16	58	17	17	17	36	17	55	18	15	18	34	18	53	19	12
	30	16	50	17	8	17	27	17	46	18	5	18	24	18	43	19	2
	40	16	40	16	59	17	18	17	37	17	56	18	15	18	33	18	52
	50	16	31	16	50	17	9	17	28	17	46	18	5	18	24	18	42
72°	0	16	23	16	41	17	0	17	18	17	37	17	55	18	14	18	32
	10	16	14	16	32	16	51	17	9	17	27	17	46	18	4	18	23
	20	16	5	16	23	16	42	17	0	17	18	17	36	17	54	18	13
	30	15	56	16	14	16	32	16	50	17	9	17	26	17	45	18	3
	40	15	48	16	5	16	23	16	41	16	59	17	17	17	35	17	53
	50	15	39	15	56	16	14	16	32	16	50	17	7	17	25	17	43
73°	0	15	30	15	47	16	5	16	22	16	40	16	58	17	15	17	33
	10	15	21	15	38	15	56	16	13	16	31	16	48	17	5	17	23
	20	15	12	15	29	15	47	16	4	16	21	16	38	16	55	17	13
	30	15	3	15	20	15	37	15	54	16	12	16	29	16	46	17	3
	40	14	54	15	11	15	28	15	45	16	2	16	19	16	36	16	53
	50	14	46	15	2	15	19	15	36	15	52	16	9	16	26	16	43
74°	0	14	37	14	53	15	10	15	26	15	43	15	59	16	16	16	33
	10	14	28	14	44	15	1	15	17	15	33	15	50	16	6	16	22
	20	14	19	14	35	14	51	15	8	15	24	15	40	15	56	16	12
	30	14	10	14	26	14	42	14	58	15	14	15	30	15	46	16	2
	40	14	1	14	17	14	33	14	49	15	5	15	20	15	36	15	52
	50	13	52	14	8	14	24	14	39	14	55	15	11	15	26	15	42

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	0	1	1	1	1	2	2	2	2
10	3	3	3	3	4	4	4	5	5	5
20	5	6	6	6	6	7	7	7	7	8
30	8	8	9	9	9	9	10	10	10	10
40	11	11	11	11	12	12	12	13	13	13
50	13	14	14	14	14	15	15	15	15	16

75°	0	13	43	13	59	14	14	14	30	14	45	15	1	15	16	15	32
	10	13	34	13	50	14	5	14	20	14	36	14	51	15	7	15	22
	20	13	25	13	41	13	56	14	11	14	26	14	41	14	57	15	12
	30	13	16	13	32	13	47	14	2	14	17	14	32	14	47	15	2
	40	13	8	13	22	13	37	13	52	14	7	14	22	14	37	14	52
	50	12	59	13	13	13	28	13	43	13	57	14	12	14	27	14	41
76°	0	12	50	13	4	13	19	13	33	13	48	14	2	14	17	14	31
	10	12	41	12	55	13	9	13	24	13	38	13	52	14	7	14	21
	20	12	32	12	46	13	0	13	14	13	28	13	43	13	57	14	11
	30	12	23	12	37	12	51	13	5	13	19	13	33	13	47	14	1
	40	12	14	12	28	12	41	12	55	13	9	13	23	13	37	13	51
	50	12	5	12	18	12	32	12	46	12	59	13	13	13	27	13	40
77°	0	11	56	12	9	12	23	12	36	12	50	13	3	13	17	13	30
	10	11	47	12	0	12	13	12	27	12	40	12	53	13	7	13	20
	20	11	38	11	51	12	4	12	17	12	30	12	43	12	57	13	10
	30	11	29	11	42	11	55	12	8	12	21	12	34	12	47	13	0
	40	11	20	11	32	11	45	11	58	12	11	12	24	12	37	12	49
	50	11	11	11	23	11	36	11	49	12	1	12	14	12	26	12	39
78°	0	11	2	11	14	11	26	11	39	11	51	12	4	12	16	12	29
	10	10	52	11	5	11	17	11	29	11	42	11	54	12	6	12	19
	20	10	43	10	56	11	8	11	20	11	32	11	44	11	56	12	8
	30	10	34	10	46	10	58	11	10	11	22	11	34	11	46	11	58
	40	10	25	10	37	10	49	11	1	11	12	11	24	11	36	11	48
	50	10	16	10	28	10	39	10	51	11	3	11	14	11	26	11	38
79°	0	10	7	10	19	10	30	10	41	10	53	11	4	11	16	11	27
	10	9	58	10	9	10	21	10	32	10	43	10	54	11	6	11	17
	20	9	49	10	0	10	11	10	22	10	33	10	44	10	56	11	7
	30	9	40	9	51	10	2	10	13	10	24	10	35	10	46	10	57
	40	9	31	9	42	9	52	10	3	10	14	10	25	10	35	10	46
	50	9	22	9	32	9	43	9	53	10	4	10	15	10	25	10	36

Proportional parts to Minutes of Altitude. { 1′ 2′ 3′ 4′ 5′ 6′ 7′ 8′ 9′ / 1″ 2″ 3″ 4″ 5″ 6″ 7″ 8″ 9″ } Subtract.

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax. 54′		55′		56′		57′		58′		59′		60′		61′	
40°	0	40′	14″	41′	0″	41′	46″	42′	32″	43′	18″	44′	4″	44′	50″	45′	36″
	10	40	8	40	54	41	40	42	26	43	12	43	58	44	44	45	29
	20	40	3	40	49	41	34	42	20	43	6	43	51	44	37	45	22
	30	39	57	40	43	41	28	42	14	43	0	43	45	44	31	45	16
	40	39	51	40	37	41	22	42	8	42	53	43	39	44	24	45	10
	50	39	46	40	31	41	16	42	2	42	47	43	33	44	18	45	3
41°	0	39	40	40	25	41	10	41	56	42	41	43	26	44	11	44	57
	10	39	34	40	19	41	4	41	49	42	35	43	20	44	5	44	50
	20	39	28	40	13	40	58	41	43	42	28	43	13	43	58	44	43
	30	39	22	40	7	40	52	41	37	42	22	43	7	43	52	44	37
	40	39	16	40	1	40	46	41	31	42	16	43	1	43	45	44	30
	50	39	10	39	55	40	40	41	25	42	9	42	54	43	39	44	23
42°	0	39	5	39	49	40	34	41	18	42	3	42	47	43	32	44	17
	10	38	59	39	43	40	28	41	12	41	57	42	41	43	25	44	10
	20	38	53	39	37	40	21	41	6	41	50	42	34	43	19	44	3
	30	38	47	39	31	40	15	40	59	41	44	42	28	43	12	43	56
	40	38	41	39	25	40	9	40	53	41	37	42	21	43	5	43	49
	50	38	35	39	19	40	3	40	47	41	31	42	15	42	59	43	43
43°	0	38	29	39	12	39	56	40	40	41	24	42	8	42	52	43	36
	10	38	22	39	6	39	50	40	34	41	18	42	1	42	45	43	29
	20	38	16	39	0	39	44	40	27	41	11	41	55	42	38	43	22
	30	38	10	38	54	39	37	40	21	41	4	41	48	42	31	43	15
	40	38	4	38	47	39	31	40	14	40	58	41	41	42	24	43	8
	50	37	58	38	41	39	24	40	8	40	51	41	34	42	18	43	1
44°	0	37	52	38	35	39	18	40	1	40	44	41	28	42	11	42	54
	10	37	46	38	29	39	12	39	55	40	38	41	21	42	4	42	47
	20	37	39	38	22	39	5	39	48	40	31	41	14	41	57	42	40
	30	37	33	38	16	38	59	39	41	40	24	41	7	41	50	42	33
	40	37	27	38	9	38	52	39	35	40	17	41	0	41	43	42	25
	50	37	20	38	3	38	46	39	28	40	11	40	53	41	36	42	18

TABLE C.

Proportional part for Seconds of Parallax.

″	″ 0	″ 1	″ 2	″ 3	″ 4	″ 5	″ 6	″ 7	″ 8	″ 9
0	0	1	1	2	3	4	4	5	6	6
10	7	8	9	9	10	11	11	12	13	14
20	14	15	16	16	17	18	19	19	20	21
30	21	22	23	24	24	25	26	26	27	28
40	29	29	30	31	31	32	33	34	34	35
50	36	36	37	38	39	39	40	41	41	42

45°	0	37	14	37	57	38	39	39	21	40	4	40	46	41	29	42	11
	10	37	8	37	50	38	32	39	15	39	57	40	39	41	22	42	4
	20	37	1	37	43	38	26	39	8	39	50	40	32	41	14	41	57
	30	36	55	37	37	38	19	39	1	39	43	40	25	41	7	41	49
	40	36	49	37	31	38	12	38	54	39	36	40	18	41	0	41	42
	50	36	42	37	24	38	6	38	48	39	29	40	11	40	53	41	35
46°	0	36	36	37	17	37	59	38	41	39	22	40	4	40	46	41	27
	10	36	29	37	11	37	52	38	34	39	15	39	57	40	39	41	20
	20	36	23	37	4	37	46	38	27	39	8	39	50	40	31	41	13
	30	36	16	36	58	37	39	38	20	39	1	39	43	40	24	41	5
	40	36	10	36	51	37	32	38	13	38	54	39	36	40	17	40	58
	50	36	3	36	44	37	25	38	6	38	47	39	28	40	9	40	50
47°	0	35	57	36	38	37	18	37	59	38	40	39	21	40	2	40	43
	10	35	50	36	31	37	12	37	52	38	33	39	14	39	55	40	36
	20	35	43	36	24	37	5	37	45	38	26	39	7	39	47	40	28
	30	35	37	36	17	36	58	37	38	38	19	38	59	39	40	40	22
	40	35	30	36	10	36	51	37	31	38	12	38	52	39	32	40	13
	50	35	23	36	3	36	44	37	24	38	5	38	45	39	25	40	5
48°	0	35	17	35	57	36	37	37	17	37	57	38	37	39	18	39	58
	10	35	10	35	50	36	30	37	10	37	50	38	30	39	10	39	50
	20	35	3	35	43	36	23	37	3	37	43	38	23	39	3	39	42
	30	34	56	35	36	36	16	36	56	37	36	38	15	38	55	39	35
	40	34	50	35	29	36	9	36	49	37	28	38	8	38	47	39	27
	50	34	43	35	22	36	2	36	41	37	21	38	0	38	40	39	19
49°	0	34	36	35	15	35	55	36	34	37	14	37	53	38	32	39	12
	10	34	29	35	9	35	48	36	27	37	6	37	45	38	25	39	4
	20	34	22	35	2	35	41	36	20	36	59	37	38	38	17	38	56
	30	34	16	34	55	35	34	36	12	36	51	37	30	38	9	38	48
	40	34	9	34	48	35	26	36	5	36	44	37	23	38	2	38	41
	50	34	2	34	39	35	19	35	58	36	37	37	15	37	54	38	33

Proportional parts to Minutes of Altitude. { 2′ 3′ 3′ 4′ 5′ 6′ 7′ 8′ 9′ / 1″ 3″ 3″ 3″ 4″ 4″ 5″ 5″ 6″ } Subtract.

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.	Moon's Horizontal Parallax.															
	54′		55′		56′		57′		58′		59′		60′		61′	
50° 0	33′	55″	34′	33″	35′	12″	35′	51″	36′	29″	37′	8″	37′	46″	38′	25″
10	33	48	34	26	35	5	35	43	36	22	37	0	37	39	38	17
20	33	41	34	19	34	58	35	36	36	14	36	52	37	31	38	9
30	33	34	34	12	34	50	35	28	36	7	36	45	37	23	38	1
40	33	27	34	5	34	43	35	21	35	59	36	37	37	15	37	53
50	33	20	33	58	34	36	35	14	35	52	36	29	37	7	37	45
51° 0	33	13	33	51	34	28	35	6	35	44	36	22	36	59	37	37
10	33	6	33	43	34	21	34	59	35	36	36	14	36	52	37	29
20	32	59	33	36	34	14	34	51	35	29	36	6	36	44	37	21
30	32	52	33	29	34	6	34	44	35	21	35	58	36	36	37	13
40	32	45	33	22	33	59	34	36	35	13	35	50	36	28	37	5
50	32	37	33	14	33	52	34	29	35	6	35	42	36	20	36	57
52° 0	32	30	33	7	33	44	34	21	34	58	35	35	36	12	36	49
10	32	23	33	0	33	37	34	13	34	50	35	27	36	4	36	41
20	32	16	32	53	33	29	34	6	34	43	35	19	35	56	36	33
30	32	9	32	45	33	22	33	58	34	35	35	11	35	48	36	24
40	32	1	32	38	33	14	33	51	34	27	35	3	35	40	36	16
50	31	54	32	30	33	7	33	43	34	19	34	55	35	32	36	8
53° 0	31	47	32	23	32	59	33	35	34	11	34	48	35	24	36	0
10	31	40	32	16	32	52	33	28	34	4	34	40	35	15	35	51
20	31	32	32	8	32	44	33	20	33	56	34	32	35	7	35	43
30	31	25	32	1	32	36	33	12	33	48	34	24	34	59	35	35
40	31	18	31	53	32	29	33	4	33	40	34	15	34	51	35	27
50	31	10	31	46	32	21	32	57	33	32	34	7	34	43	35	18
54° 0	31	3	31	38	32	13	32	49	33	24	33	59	34	35	35	10
10	30	56	31	31	32	6	32	41	33	16	33	51	34	26	35	2
20	30	48	31	23	31	58	32	33	33	8	33	43	34	18	34	53
30	30	41	31	16	31	51	32	25	33	0	33	35	34	10	34	45
40	30	33	31	8	31	43	32	18	32	52	33	27	34	2	34	36
50	[illegible]	[illegible]	31	1	31	35	32	10	32	44	33	19	33	53	34	28

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	1	1	2	2	3	3	4	5	5
10	6	6	7	8	8	9	9	10	10	11
20	12	12	13	13	14	15	15	16	16	17
30	17	18	19	19	20	20	21	21	22	23
40	23	24	24	25	26	26	27	27	28	28
50	29	30	30	31	31	32	32	33	34	34

55°	0	30	19	30	53	31	27	32	2	32	36	33	11	33	45	34	19
	10	30	11	30	45	31	20	31	54	32	28	33	2	33	37	34	11
	20	30	4	30	38	31	12	31	46	32	20	32	54	33	28	34	2
	30	29	56	30	30	31	4	31	38	32	12	32	46	33	20	33	54
	40	29	48	30	22	30	56	31	30	32	4	32	38	33	12	33	45
	50	29	41	30	15	30	47	31	22	31	56	32	29	33	3	33	37
56°	0	29	33	30	7	30	40	31	14	31	48	32	21	32	55	33	28
	10	29	26	29	59	30	33	31	6	31	39	32	13	32	46	33	20
	20	29	18	29	51	30	25	30	58	31	31	32	4	32	38	33	11
	30	29	11	29	44	30	17	30	50	31	23	31	56	32	29	33	2
	40	29	3	29	36	30	9	30	42	31	15	31	48	32	21	32	54
	50	28	55	29	28	30	1	30	34	31	7	31	39	32	12	32	45
57°	0	28	48	29	20	29	53	30	26	30	58	31	31	32	4	32	36
	10	28	40	29	12	29	45	30	18	30	50	31	23	31	55	32	28
	20	28	32	29	5	29	37	30	9	30	42	31	14	31	47	32	19
	30	28	25	28	57	29	29	30	1	30	34	31	6	31	38	32	10
	40	28	17	28	49	29	21	29	53	30	25	30	57	31	29	32	1
	50	28	9	28	41	29	13	29	45	30	17	30	49	31	21	31	53
58°	0	28	1	28	33	29	5	29	37	30	9	30	40	31	12	31	44
	10	27	54	28	25	28	57	29	29	30	0	30	32	31	3	31	35
	20	27	46	28	17	28	49	29	20	29	52	30	23	30	55	31	26
	30	27	38	28	9	28	41	29	12	29	43	30	15	30	46	31	17
	40	27	30	28	1	28	33	29	4	29	35	30	6	30	37	31	9
	50	27	22	27	53	28	24	28	55	29	27	29	58	30	29	31	0
59°	0	27	15	27	45	28	16	28	47	29	18	29	49	30	20	30	51
	10	27	7	27	37	28	8	28	39	29	10	29	40	30	11	30	42
	20	26	59	27	29	28	0	28	31	29	1	29	32	30	2	30	33
	30	26	51	27	21	27	51	28	22	28	53	29	23	29	54	30	24
	40	26	43	27	13	27	44	28	14	28	44	29	14	29	45	30	15
	50	26	35	27	5	27	35	28	6	28	36	29	6	29	36	30	6

Proportional parts to Minutes of Altitude.	1′	2′	3′	4′	5′	6′	7′	8′	9′	Subtract.
	1″	2″	2″	4″	5″	6″	6″	7″	7″	

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.	Moon's Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
60° 0	26′ 27″	26′ 57″	27′ 27″	27′ 57″	28′ 27″	28′ 57″	29′ 27″	29′ 57″
10	26 19	26 49	27 19	27 49	28 19	28 48	29 19	29 48
20	26 11	26 41	27 11	27 40	28 10	28 40	29 9	29 39
30	26 3	26 33	27 2	27 32	28 1	28 31	29 0	29 30
40	25 55	26 25	26 54	27 23	27 53	28 22	28 52	29 21
50	25 47	26 16	26 46	27 15	27 44	28 13	28 43	29 12
61° 0	25 39	26 8	26 37	27 6	27 36	28 5	28 34	29 3
10	25 31	26 0	26 29	26 58	27 27	27 56	28 25	28 54
20	25 23	25 52	26 21	26 49	27 18	27 47	28 16	28 45
30	25 15	25 44	26 12	26 41	27 10	27 38	28 7	28 35
40	25 7	25 35	26 4	26 32	27 1	27 29	27 58	28 26
50	24 59	25 27	25 56	26 24	26 52	27 21	27 49	28 17
62° 0	24 51	25 19	25 47	26 15	26 43	27 12	27 40	28 8
10	24 43	25 11	25 39	26 7	26 35	27 3	27 31	27 59
20	24 35	25 2	25 30	25 58	26 26	26 54	27 22	27 50
30	24 26	24 54	25 22	25 50	26 17	26 45	27 13	27 40
40	24 18	24 46	25 13	25 41	26 8	26 36	27 4	27 31
50	24 10	24 37	25 5	25 32	26 0	26 27	26 54	27 22
63° 0	24 2	24 29	24 56	25 25	25 51	26 18	26 45	27 13
10	23 54	24 21	24 48	25 15	25 42	26 9	26 36	27 3
20	23 45	24 12	24 39	25 6	25 33	26 0	26 27	26 54
30	23 37	24 4	24 31	24 58	25 24	25 51	26 18	26 45
40	23 29	23 56	24 22	24 49	25 15	25 42	26 9	26 35
50	23 21	23 47	24 14	24 40	25 7	25 33	26 0	26 26
64° 0	23 13	23 39	24 5	24 31	24 58	25 24	25 50	26 17
10	23 4	23 30	23 57	24 22	24 49	25 15	25 41	26 7
20	22 56	23 22	23 48	24 14	24 40	25 6	25 32	25 58
30	22 48	23 14	23 39	24 5	24 31	24 57	25 23	25 48
40	22 39	23 5	23 31	23 56	24 22	24 48	25 13	25 39
50	22 31	22 57	23 22	23 48	24 13	24 39	25 4	25 30

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	0	1	1	2	2	3	3	3	4
10	4	5	5	6	6	6	7	7	7	8
20	9	9	9	10	10	11	11	12	12	12
30	13	13	14	14	15	15	15	16	16	17
40	17	18	18	18	19	19	20	20	21	21
50	22	22	22	23	23	24	24	25	25	25

65°	0	22	23	22	48	23	13	23	39	24	4	24	30	24	55	25	20
	10	22	14	22	40	23	5	23	30	23	55	24	20	24	46	25	11
	20	22	6	22	31	22	56	23	21	23	46	24	11	24	36	25	1
	30	21	58	22	23	22	47	23	12	23	37	24	2	24	27	24	52
	40	21	49	22	14	22	39	23	3	23	28	23	53	24	18	24	43
	50	21	41	22	5	22	30	22	55	23	19	23	44	24	8	24	33
66°	0	21	32	21	57	22	21	22	46	23	10	23	34	23	59	24	23
	10	21	24	21	48	22	13	22	37	23	1	23	25	23	50	24	14
	20	21	16	21	40	22	4	22	28	22	52	23	16	23	40	24	4
	30	21	7	21	31	21	55	22	19	22	43	23	7	23	31	23	55
	40	20	59	21	22	21	46	22	10	22	34	22	58	23	21	23	45
	50	20	50	21	14	21	37	22	1	22	25	22	48	23	12	23	35
67°	0	20	42	21	5	21	29	21	52	22	16	22	39	23	2	23	26
	10	20	33	20	57	21	20	21	43	22	6	22	30	22	53	23	16
	20	20	25	20	48	21	11	21	34	21	57	22	20	22	44	23	7
	30	20	16	20	39	21	2	21	25	21	48	22	11	22	34	22	57
	40	20	7	20	31	20	53	21	16	21	39	22	2	22	25	22	47
	50	19	59	20	22	20	45	21	7	21	30	21	52	22	15	22	38
68°	0	19	51	20	13	20	36	20	58	21	21	21	43	22	6	22	28
	10	19	42	20	4	20	27	20	49	21	11	21	34	21	56	22	18
	20	19	34	19	56	20	18	20	40	21	2	21	24	21	47	22	9
	30	19	25	19	47	20	9	20	31	20	53	21	15	21	37	21	59
	40	19	16	19	38	20	0	20	22	20	44	21	6	21	27	21	49
	50	19	8	19	30	19	51	20	13	20	35	20	56	21	18	21	39
69°	0	18	59	19	21	19	42	20	4	20	25	20	47	21	8	21	30
	10	18	51	19	12	19	33	19	55	20	16	20	37	20	58	21	20
	20	18	42	19	3	19	24	19	46	20	7	20	28	20	49	21	10
	30	18	33	18	54	19	15	19	36	19	57	20	18	20	39	21	0
	40	18	25	18	46	19	6	19	27	19	48	20	9	20	30	20	51
	50	18	15	18	36	18	56	19	17	19	38	19	59	20	19	20	40

Proportional parts to Minutes of Altitude.	1'	2'	3'	4'	5'	6'	7'	8'	9'	Subtract.
	1"	2"	3"	4"	4"	5"	6"	7"	8"	

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.		Moon's Horizontal Parallax. 54′		55′		56′		57′		58′		59′		60′		61′	
70°	0	18′	7″	18′	28″	18′	48″	19′	9″	19′	30″	19′	50″	20′	11″	20′	31″
	10	17	59	18	19	18	39	19	0	19	20	19	41	20	1	20	21
	20	17	50	18	10	18	30	18	51	19	11	19	31	19	51	20	11
	30	17	41	18	1	18	21	18	41	19	1	19	22	19	42	20	2
	40	17	33	17	53	18	12	18	32	18	52	19	12	19	32	19	52
	50	17	24	17	44	18	3	18	23	18	43	19	2	19	22	19	42
71°	0	17	15	17	35	17	54	18	14	18	33	18	53	19	12	19	32
	10	17	6	17	26	17	45	18	5	18	24	18	43	19	3	19	22
	20	16	58	17	17	17	36	17	55	18	15	18	34	18	53	19	12
	30	16	50	17	8	17	27	17	46	18	5	18	24	18	43	19	2
	40	16	40	16	59	17	18	17	37	17	56	18	15	18	33	18	52
	50	16	31	16	50	17	9	17	28	17	46	18	5	18	24	18	42
72°	0	16	23	16	41	17	0	17	18	17	37	17	55	18	14	18	32
	10	16	14	16	32	16	51	17	9	17	27	17	46	18	4	18	23
	20	16	5	16	23	16	42	17	0	17	18	17	36	17	54	18	13
	30	15	56	16	14	16	32	16	50	17	9	17	26	17	45	18	3
	40	15	48	16	5	16	23	16	41	16	59	17	17	17	35	17	53
	50	15	39	15	56	16	14	16	32	16	50	17	7	17	25	17	43
73°	0	15	30	15	47	16	5	16	22	16	40	16	58	17	15	17	33
	10	15	21	15	38	15	56	16	13	16	31	16	48	17	5	17	23
	20	15	12	15	29	15	47	16	4	16	21	16	38	16	55	17	13
	30	15	3	15	20	15	37	15	54	16	12	16	29	16	46	17	3
	40	14	54	15	11	15	28	15	45	16	2	16	19	16	36	16	53
	50	14	46	15	2	15	19	15	36	15	52	16	9	16	26	16	43
74°	0	14	37	14	53	15	10	15	26	15	43	15	59	16	16	16	33
	10	14	28	14	44	15	1	15	17	15	33	15	50	16	6	16	22
	20	14	19	14	35	14	51	15	8	15	24	15	40	15	56	16	12
	30	14	10	14	26	14	42	14	58	15	14	15	30	15	46	16	2
	40	14	1	14	17	14	33	14	49	15	5	15	20	15	36	15	52
	50	13	52	14	8	14	24	14	39	14	55	15	11	15	26	15	42

TABLE C.

Proportional part for Seconds of Parallax.

″	0″	1″	2″	3″	4″	5″	6″	7″	8″	9″
0	0	0	1	1	1	1	2	2	2	2
10	3	3	3	3	4	4	4	5	5	5
20	5	6	6	6	6	7	7	7	7	8
30	8	8	9	9	9	9	10	10	10	10
40	11	11	11	11	12	12	12	13	13	13
50	13	14	14	14	14	15	15	15	15	16

75°	0	13	43	13	59	14	14	14	30	14	45	15	1	15	16	15	32
	10	13	34	13	50	14	5	14	20	14	36	14	51	15	7	15	22
	20	13	25	13	41	13	56	14	11	14	26	14	41	14	57	15	12
	30	13	16	13	32	13	47	14	2	14	17	14	32	14	47	15	2
	40	13	8	13	22	13	37	13	52	14	7	14	22	14	37	14	52
	50	12	59	13	13	13	28	13	43	13	57	14	12	14	27	14	41
76°	0	12	50	13	4	13	19	13	33	13	48	14	2	14	17	14	31
	10	12	41	12	55	13	9	13	24	13	38	13	52	14	7	14	21
	20	12	32	12	46	13	0	13	14	13	28	13	43	13	57	14	11
	30	12	23	12	37	12	51	13	5	13	19	13	33	13	47	14	1
	40	12	14	12	28	12	41	12	55	13	9	13	23	13	37	13	51
	50	12	5	12	18	12	32	12	46	12	59	13	13	13	27	13	40
77°	0	11	56	12	9	12	23	12	36	12	50	13	3	13	17	13	30
	10	11	47	12	0	12	13	12	27	12	40	12	53	13	7	13	20
	20	11	38	11	51	12	4	12	17	12	30	12	43	12	57	13	10
	30	11	29	11	42	11	55	12	8	12	21	12	34	12	47	13	0
	40	11	20	11	32	11	45	11	58	12	11	12	24	12	37	12	49
	50	11	11	11	23	11	36	11	49	12	1	12	14	12	26	12	39
78°	0	11	2	11	14	11	26	11	39	11	51	12	4	12	16	12	29
	10	10	52	11	5	11	17	11	29	11	42	11	54	12	6	12	19
	20	10	43	10	56	11	8	11	20	11	32	11	44	11	56	12	8
	30	10	34	10	46	10	58	11	10	11	22	11	34	11	46	11	58
	40	10	25	10	37	10	49	11	1	11	12	11	24	11	36	11	48
	50	10	16	10	28	10	39	10	51	11	3	11	14	11	26	11	38
79°	0	10	7	10	19	10	30	10	41	10	53	11	4	11	16	11	27
	10	9	58	10	9	10	21	10	32	10	43	10	54	11	6	11	17
	20	9	49	10	0	10	11	10	22	10	33	10	44	10	56	11	7
	30	9	40	9	51	10	2	10	13	10	24	10	35	10	46	10	57
	40	9	31	9	42	9	52	10	3	10	14	10	25	10	35	10	46
	50	9	22	9	32	9	43	9	53	10	4	10	15	10	25	10	36

Proportional parts to Minutes of Altitude. { 1′ 2′ 3′ 4′ 5′ 6′ 7′ 8′ 9′ / 1″ 2″ 3″ 4″ 5″ 6″ 7″ 8″ 9″ } Subtract.

TABLE VI.

Correction of the Moon's Apparent Altitude.

Moon's App. Alt.	Moon's Horizontal Parallax. 54′	55′	56′	57′	58′	59′	60′	61′
80° 0	9′ 13″	9′ 23″	9′ 33″	9′ 44″	9′ 54″	10′ 5″	10′ 15″	10′ 25″
10	9 3	9 14	9 24	9 34	9 44	9 55	10 5	10 15
20	8 54	9 4	9 15	9 25	9 35	9 45	9 55	10 5
30	8 45	8 55	9 5	9 15	9 25	9 35	9 45	9 55
40	8 36	8 46	8 56	9 5	9 15	9 25	9 34	9 44
50	8 27	8 37	8 46	8 56	9 5	9 15	9 24	9 34
81° 0	8 18	8 27	8 37	8 46	8 55	9 5	9 14	9 24
10	8 9	8 18	8 27	8 36	8 46	8 55	9 4	9 13
20	8 0	8 9	8 18	8 27	8 36	8 45	8 54	9 3
30	7 50	7 59	8 8	8 17	8 26	8 35	8 44	8 52
40	7 41	7 50	7 59	8 7	8 16	8 25	8 33	8 42
50	7 32	7 41	7 49	7 58	8 6	8 15	8 23	8 32
82° 0	7 23	7 31	7 40	7 48	7 56	8 5	8 13	8 21
10	7 14	7 22	7 30	7 38	7 46	7 55	8 3	8 11
20	7 5	7 13	7 21	7 29	7 37	7 45	7 53	8 1
30	6 55	7 3	7 11	7 19	7 27	7 35	7 42	7 50
40	6 46	6 54	7 2	7 9	7 17	7 25	7 32	7 40
50	6 37	6 45	6 52	7 0	7 7	7 14	7 22	7 29
83° 0	6 28	6 35	6 42	6 50	6 57	7 4	7 12	7 19
10	6 19	6 26	6 33	6 40	6 47	6 54	7 2	7 9
20	6 9	6 16	6 23	6 30	6 37	6 44	6 51	6 58
30	6 0	6 7	6 14	6 21	6 27	6 34	6 41	6 48
40	5 51	5 58	6 4	6 11	6 18	6 24	6 31	6 37
50	5 42	5 48	5 55	6 1	6 8	6 14	6 21	6 27
84° 0	5 33	5 39	5 45	5 52	5 58	6 4	6 10	6 17
10	5 23	5 30	5 36	5 42	5 48	5 54	6 0	6 6
20	5 14	5 20	5 26	5 32	5 38	5 44	5 50	5 56
30	5 5	5 11	5 17	5 22	5 28	5 34	5 40	5 45
40	4 56	5 1	5 7	5 13	5 18	5 24	5 29	5 35
50	4 47	4 52	4 57	5 3	5 8	5 14	5 19	5 24

TABLE C.

Proportional part for Seconds of Parallax.

″	″ 0	″ 1	″ 2	″ 3	″ 4	″ 5	″ 6	″ 7	″ 8	″ 9
0	0	0	0	0	0	0	1	1	1	1
10	1	1	1	1	1	1	2	2	2	2
20	2	2	2	2	2	2	2	3	3	3
30	3	3	3	3	3	3	3	4	4	4
40	4	4	4	4	4	4	4	5	5	5
50	5	5	5	5	5	5	5	5	6	6

85°	0	4	37	4	43	4	48	4	53	4	58	5	4	5	9	5	14
	10	4	28	4	33	4	38	4	43	4	48	4	53	4	59	5	4
	20	4	19	4	24	4	29	4	34	4	38	4	43	4	48	4	53
	30	4	10	4	14	4	19	4	24	4	29	4	33	4	38	4	43
	40	4	0	4	5	4	10	4	14	4	19	4	23	4	28	4	32
	50	3	51	3	56	4	0	4	4	4	9	4	13	4	17	4	22
86°	0	3	42	3	46	3	50	3	55	3	59	4	3	4	7	4	11
	10	3	33	3	37	3	41	3	45	3	49	3	53	3	57	4	1
	20	3	24	3	27	3	31	3	35	3	39	3	43	3	47	3	50
	30	3	14	3	18	3	22	3	25	3	29	3	33	3	36	3	40
	40	3	5	3	9	3	12	3	16	3	19	3	23	3	26	3	30
	50	2	56	2	59	3	2	3	6	3	9	3	12	3	16	3	19
87°	0	2	46	2	50	2	53	2	56	2	59	3	2	3	5	3	9
	10	2	37	2	40	2	43	2	46	2	49	2	52	2	55	2	58
	20	2	28	2	31	2	34	2	36	2	39	2	42	2	45	2	48
	30	2	19	2	21	2	24	2	27	2	29	2	32	2	35	2	37
	40	2	10	2	12	2	14	2	17	2	19	2	22	2	24	2	27
	50	2	0	2	3	2	5	2	7	2	9	2	12	2	14	2	16
88°	0	1	51	1	53	1	55	1	57	1	59	2	2	2	4	2	6
	10	1	42	1	44	1	46	1	48	1	50	1	51	1	53	1	55
	20	1	33	1	34	1	36	1	38	1	40	1	41	1	43	1	45
	30	1	23	1	25	1	26	1	28	1	30	1	31	1	33	1	34
	40	1	14	1	15	1	17	1	18	1	20	1	21	1	22	1	24
	50	1	5	1	6	1	7	1	8	1	10	1	11	1	12	1	13
89°	0	0	56	0	57	0	58	0	59	1	0	1	1	1	2	1	3
	10	0	46	0	47	0	48	0	49	0	50	0	51	0	52	0	52
	20	0	37	0	38	0	38	0	39	0	40	0	41	0	41	0	42
	30	0	28	0	28	0	29	0	29	0	30	0	30	0	31	0	31
	40	0	18	0	19	0	19	0	20	0	20	0	20	0	21	0	21
	50	0	9	0	9	0	10	0	10	0	10	0	10	0	10	0	10

Proportional parts to Minutes of Altitude. $\left\{ \begin{array}{l} 1'\ 2'\ 3'\ 4'\ 5'\ 6'\ 7'\ 8'\ 9' \\ 1''\ 2''\ 3''\ 4''\ 5''\ 6''\ 7''\ 8''\ 9'' \end{array} \right\}$ Subtract.

M.	15°	16°	17°	18°	19°	20°	21°	22°	23°	24°	25°	26°	28°	30°	32°
5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
8	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1
10	3	3	3	3	2	2	2	2	2	2	2	2	2	1	1
11	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2
12	4	4	4	4	3	3	3	3	3	3	3	3	2	2	2
13	5	5	5	5	4	4	4	3	3	3	3	3	3	2	2
14	6	6	6	6	5	5	4	4	4	4	4	4	3	3	3
15	7	7	6	6	6	5	5	5	4	4	4	4	4	3	3
16	8	8	7	7	6	6	6	6	5	5	5	5	5	4	4
17	9	9	8	8	7	7	6	6	6	5	5	5	5	4	4
18	10	10	9	9	8	8	7	7	6	6	6	6	6	5	5
19	12	11	10	10	9	8	8	8	7	7	7	6	6	5	5
20	13	12	11	11	10	9	9	9	8	8	7	7	7	6	6
21	14	13	12	12	11	10	10	10	9	9	8	8	7	7	6
22	16	15	14	13	12	12	11	11	10	10	9	9	8	7	7
23	17	16	15	14	14	13	12	11	11	10	10	9	9	8	7
24	19	18	17	16	15	14	13	12	11	11	10	10	9	9	8
25	21	19	18	17	16	15	14	13	12	12	11	11	10	9	9
26	22	21	19	18	17	16	15	15	13	13	12	12	11	10	9
27	24	22	21	19	18	17	16	16	15	14	13	13	12	11	10
28	26	24	22	21	20	19	18	17	16	15	14	14	13	12	11
29	28	25	24	22	21	20	19	18	17	16	15	15	14	13	12
30	29	27	25	24	22	21	20	19	18	17	16	16	15	14	13
31	31	29	27	25	24	23	22	21	19	18	18	17	16	15	14
32	33	31	29	27	25	24	23	22	21	20	19	18	17	16	15
33	35	33	31	29	27	25	24	23	22	21	20	19	18	17	16
34	38	35	33	31	29	27	25	24	23	22	21	20	19	18	17
35	40	37	35	33	31	29	27	26	24	23	23	21	20	19	17
36	42	40	37	35	33	31	29	28	26	25	24	22	21	20	18
37	45	42	39	37	35	32	31	29	28	26	25	24	22	21	19
38	47	44	41	39	36	34	32	31	29	28	27	26	23	22	20
39	50	46	43	41	38	36	34	32	31	29	28	27	24	23	21
40	52	49	46	43	40	38	36	34	32	31	30	29	26	24	22
41	55	51	48	45	42	40	38	36	34	33	32	30	27	25	23
42	58	54	50	47	44	42	40	38	36	35	33	32	29	27	25
43	60	56	53	49	47	44	42	39	38	36	35	33	30	28	26
44	63	59	55	52	49	46	43	41	39	38	36	35	32	29	27
45	66	61	58	54	51	48	46	43	41	40	38	36	33	30	28
46	69	64	60	57	54	51	48	45	43	42	40	38	35	32	29
47	72	67	63	59	56	53	49	47	45	43	42	40	36	33	30
48	75	70	65	61	58	55	52	50	47	45	43	42	38	35	32
49	78	73	69	64	61	57	55	52	49	46	45	43	39	36	33
50	81	76	71	67	63	60	57	53	51	48	46	45	41	38	35
51	85	79	74	69	66	62	59	56	53	50	49	47	43	39	36
52	89	83	77	72	68	65	61	58	55	53	51	49	45	41	38
53	92	86	80	74	71	67	64	60	58	55	53	50	46	42	39
54	95	89	83	77	73	70	66	63	60	57	54	52	48	44	41
55	99	92	86	80	76	72	69	65	62	59	57	54	49	45	42
56	103	95	89	83	79	75	71	68	65	62	59	56	51	47	44
57	107	99	93	86	82	77	74	70	67	64	61	58	53	49	45
58	110	103	96	90	85	80	76	73	69	66	63	60	55	51	47
59	115	106	100	93	88	83	79	75	72	68	65	62	57	53	48
60	119	110	103	97	91	86	82	78	74	70	67	64	59	54	50
	122	113	107	100	94	89	85	80	76	72	69	66	61	56	52
	125	117	110	103	97	92	87	83	79	75	72	69	63	58	54

M.	34°	36°	38°	40°	42°	45°	50°	55°	60° 120°	65° 115°	70° 110°	75° 105°	80° 100°	85° 95°	90° 90°
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
11	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
12	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0
13	2	2	2	2	2	1	1	1	0	0	0	0	0	0	0
14	2	2	2	2	2	2	1	1	1	1	0	0	0	0	0
15	3	3	2	2	2	2	1	1	1	1	0	0	0	0	0
16	3	3	2	2	2	2	2	1	1	1	0	0	0	0	0
17	4	3	3	3	3	2	2	1	1	1	0	0	0	0	0
18	4	4	3	3	3	2	2	2	1	1	1	0	0	0	0
19	5	4	4	3	3	2	3	2	1	1	1	0	0	0	0
20	5	5	4	4	4	3	3	2	1	1	1	1	0	0	0
21	6	5	5	4	4	4	3	2	1	1	1	1	0	0	0
22	6	6	5	5	5	4	3	3	2	2	1	1	0	0	0
23	7	6	6	5	5	4	3	3	2	2	1	1	0	0	0
24	7	7	6	6	6	5	4	3	2	2	1	1	1	0	0
25	8	7	7	6	6	5	4	3	2	2	1	1	1	0	0
26	9	8	7	7	7	6	5	4	3	3	2	1	1	0	0
27	9	9	8	7	7	6	5	4	3	3	2	1	1	0	0
28	10	9	8	8	8	7	6	5	3	3	2	2	1	0	0
29	11	10	9	9	8	7	6	5	3	3	2	2	1	0	0
30	12	11	10	9	9	8	6	5	4	4	3	2	1	0	0
31	13	11	11	10	9	8	7	5	4	4	3	2	1	0	0
32	14	12	11	10	10	9	7	5	4	4	3	2	1	0	0
33	14	13	12	11	10	9	7	5	4	4	3	2	1	0	0
34	15	14	13	12	11	10	8	6	5	4	4	2	1	0	0
35	16	14	13	13	11	10	8	6	5	4	4	2	1	0	0
36	17	15	14	13	12	11	9	7	5	5	4	3	2	1	0
37	18	16	15	14	12	11	10	8	5	5	4	3	2	1	0
38	19	17	16	15	13	12	11	9	6	5	4	3	2	1	0
39	20	18	17	16	14	13	11	9	6	5	4	3	2	1	0
40	21	19	18	17	15	13	11	10	7	6	5	3	2	1	0
41	22	20	19	18	16	14	11	10	7	6	5	3	2	1	0
42	23	21	20	18	17	15	11	11	8	7	5	4	2	1	0
43	24	22	21	19	17	15	12	11	8	7	5	4	2	1	0
44	25	23	22	20	18	16	12	11	9	7	6	4	2	1	0
45	26	24	23	21	19	17	12	11	9	7	6	4	2	1	0
46	27	25	24	22	19	18	14	12	9	8	7	5	3	1	0
47	28	26	25	23	21	19	15	12	9	8	7	5	3	1	0
48	30	28	26	24	22	20	16	13	10	9	7	5	3	2	0
49	31	29	27	26	24	21	17	14	10	9	7	5	3	2	0
50	32	30	28	27	25	22	18	15	11	10	8	6	4	2	0
51	33	31	29	28	25	22	18	15	11	10	8	6	4	2	0
52	35	32	30	29	26	23	19	16	12	10	8	6	4	2	0
53	36	33	31	30	27	24	19	16	12	10	8	6	4	2	0
54	38	35	32	31	28	25	20	17	13	11	9	7	4	2	0
55	39	36	33	32	29	26	21	18	13	11	9	7	4	2	0
56	41	38	35	33	30	27	22	18	14	12	9	7	5	2	0
57	42	39	36	35	31	28	23	19	14	12	9	7	5	2	0
58	44	40	37	36	32	29	24	20	15	13	10	7	5	2	0
59	45	41	38	37	33	30	25	21	15	13	10	7	5	2	0
60	47	43	40	38	34	31	26	22	16	14	11	8	5	3	0
61	48	44	41	39	35	32	27	23	17	15	11	8	5	3	0

TABLE VIII.

Augmentation of Moon's semi-diameter.

Arg. App. Alt. ☽	Arg. Hor. semid. of the Moon. 14′ 30″	15′ 0″	15′ 30″	16′ 0″	16′ 30″	17′ 0″
0°	0″	0″	0″	0″	0″	0″
3	0	0	1	1	1	1
6	1	1	2	2	2	2
9	2	2	2	2	3	3
12	3	3	3	3	4	4
15	4	4	4	4	5	5
18	4	4	5	5	5	6
21	5	5	6	6	6	7
24	5	6	6	6	7	7
27	6	6	7	7	8	8
30	7	7	8	8	9	9
33	7	8	8	9	10	10
36	8	9	9	10	10	11
39	8	9	10	10	11	12
42	9	10	10	11	12	12
45	9	10	11	12	12	13
48	10	11	12	12	13	14
51	10	11	12	13	14	14
54	11	12	13	13	14	15
57	11	12	13	14	15	16
60	12	13	14	14	15	16
63	12	13	14	15	16	17
66	12	13	14	15	16	17
69	13	14	15	15	16	17
72	13	14	15	16	17	18
75	13	14	15	16	17	18
78	13	14	15	16	17	18
81	13	14	15	16	17	18
84	13	14	15	16	18	19
90	13	14	16	17	18	19

TABLE IX.

Dip of the Horizon.

Height. Feet	Dip. ′ ″
1	0 56
2	1 21
3	1 40
4	1 56
5	2 9
6	2 21
7	2 33
8	2 44
9	2 53
10	3 2
11	3 10
12	3 19
13	3 27
14	3 36
15	3 42
16	3 50
17	3 57
18	4 4
19	4 11
20	4 17
21	4 23
22	4 30
23	4 36
24	4 42
26	4 52
28	5 5
30	5 15
35	5 39
40	6 4
45	6 27
50	6 46
60	7 25
70	8 1
80	8 34
90	9 6
100	9 35

TABLE X.

Sun's par. in Alt.

Altit. °	Parall. ″
0	9
10	9
20	8
30	8
40	7
50	6
55	5
60	4
65	4
70	3
75	2
80	2
85	1
90	0

TABLE XI.

Is entered with the Reduced Time from Noon or Midnight at the top, and the difference of Semi-diameter and Horizontal Parallax for twelve hours in the left side column; under the former, and opposite the latter, is the correction to be applied to the number, marked first in the Nautical Almanac.

Diff. in 12 hrs.	Reduced Time after Noon or Midnight.															
	h. m. 0 10	h. m. 0 20	h. m. 0 30	h. m. 0 40	h. m. 0 50	h. m. 1 0	h. m. 2 0	h. m. 3 0	h. m. 4 0	h. m. 5 0	h. m. 6 0	h. m. 7 0	h. m. 8 0	h. m. 9 0	h. m. 10 0	h. m. 11 0
1″	0″	0″	0″	0″	0″	0″	0″	0″	0″	0″	0″	1″	1″	1″	1″	1″
2	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2
3	0	0	0	0	0	0	0	1	1	1	1	2	2	2	3	3
4	0	0	0	0	0	0	1	1	1	2	2	2	3	3	3	4
5	0	0	0	0	0	0	1	1	2	2	2	3	3	4	4	5
6	0	0	0	0	0	0	1	1	2	2	3	3	4	5	5	6
7	0	0	0	0	0	1	1	2	2	3	3	4	5	5	6	6
8	0	0	0	0	1	1	1	2	3	3	4	5	5	6	7	7
9	0	0	0	0	1	1	1	2	3	4	4	5	6	7	8	8
10	0	0	0	1	1	1	2	2	3	4	5	6	7	8	8	9
11	0	0	0	1	1	1	2	3	4	5	5	6	7	8	9	10
12	0	0	0	1	1	1	2	3	4	5	6	7	8	9	10	11
13	0	0	1	1	1	1	2	3	4	5	6	8	9	10	11	12
14	0	0	1	1	1	1	2	3	5	6	7	8	9	11	12	13
15	0	0	1	1	1	1	2	4	5	6	7	9	10	11	13	14
16	0	0	1	1	1	1	3	4	5	7	8	9	11	12	13	15
17	0	0	1	1	1	1	3	4	6	7	8	10	11	13	14	16
18	0	0	1	1	1	1	3	4	6	7	9	11	12	14	15	17
19	0	1	1	1	1	2	3	5	6	8	9	11	13	14	16	17
20	0	1	1	1	1	2	3	5	7	8	10	12	13	15	17	18
21	0	1	1	1	2	2	3	5	7	9	10	12	14	16	18	19
22	0	1	1	1	2	2	4	5	7	9	11	13	15	17	18	20
23	0	1	1	1	2	2	4	6	8	10	11	13	15	17	19	21
24	0	1	1	1	2	2	4	6	8	10	12	14	16	18	20	22
25	0	1	1	1	2	2	4	6	8	10	12	15	17	19	21	23
26	0	1	1	1	2	2	4	6	9	11	13	15	17	20	22	24
27	0	1	1	1	2	2	4	7	9	11	13	16	18	20	23	25
28	0	1	1	2	2	2	5	7	9	12	14	16	19	21	23	26
29	0	1	1	2	2	2	5	7	10	12	14	17	19	22	24	27
30	0	1	1	2	2	2	5	7	10	12	15	17	20	23	25	28
31	0	1	1	2	2	3	5	8	10	13	15	18	21	23	26	28
32	0	1	1	2	2	3	5	8	11	13	16	19	21	24	27	29
33	0	1	1	2	2	3	5	8	11	14	16	19	22	25	28	30
34	0	1	1	2	2	3	6	8	11	14	17	20	22	26	28	31
35	0	1	1	2	2	3	6	9	12	15	17	20	23	26	29	32
36	0	1	2	2	2	3	6	9	12	15	18	21	24	27	30	33
37	1	1	2	2	3	3	6	9	12	15	18	22	25	28	31	34
38	1	1	2	2	3	3	6	9	13	16	19	22	25	29	32	35
39	1	1	2	2	3	3	6	10	13	16	19	23	26	29	33	36
40	1	1	2	2	3	3	7	10	13	17	20	23	27	30	[illegible]	[illegible]

TABLE XII.

To convert time to Longitude.

Hours.	Deg.	M	D	M	M	D	M
		S	M	S	S	M	S
		T	S	T	T	S	T
1	15	1	0	15	31	7	45
2	30	2	0	30	32	8	0
3	45	3	0	45	33	8	15
4	60	4	1	0	34	8	30
5	75	5	1	15	35	8	45
6	90	6	1	30	36	9	0
7	105	7	1	45	37	9	15
8	120	8	2	0	38	9	30
9	135	9	2	15	39	9	45
10	150	10	2	30	40	10	0
11	165	11	2	45	41	10	15
12	180	12	3	0	42	10	30
13	195	13	3	15	43	10	45
14	210	14	3	30	44	11	0
15	225	15	3	45	45	11	15
16	240	16	4	0	46	11	30
17	255	17	4	15	47	11	45
18	270	18	4	30	48	12	0
19	285	19	4	45	49	12	15
20	300	20	5	0	50	12	30
21	315	21	5	15	51	12	45
22	330	22	5	30	52	13	0
23	345	23	5	45	53	13	15
24	360	24	6	0	54	13	30
		25	6	15	55	13	45
		26	6	30	56	14	0
		27	6	45	57	14	15
		28	7	0	58	14	30
		29	7	15	59	14	45
		30	7	30	60	15	0

TABLE XIII.

To reduce Longitude to Time.

D	H	M	D	H	M	Deg.	H.Min.
M	M	S	M	M	S		
S	S	T	S	S	T		
1	0	4	31	2	4	70	4 40
2	0	8	32	2	8	80	5 20
3	0	12	33	2	12	90	6 0
4	0	16	34	2	16	100	6 40
5	0	20	35	2	20	110	7 20
6	0	24	36	2	24	120	8 0
7	0	28	37	2	28	130	8 40
8	0	32	38	2	32	140	9 20
9	0	36	39	2	36	150	10 0
10	0	40	40	2	40	160	10 40
11	0	44	41	2	44	170	11 20
12	0	48	42	2	48	180	12 0
13	0	52	43	2	52	190	12 40
14	0	56	44	2	56	200	12 20
15	1	0	45	3	0	210	14 0
16	1	4	46	3	4	220	14 40
17	1	8	47	3	8	230	15 20
18	1	12	48	3	12	240	16 0
19	1	16	49	3	16	250	16 40
20	1	20	50	3	20	260	17 20
21	1	24	51	3	24	270	18 0
22	1	28	52	3	28	280	18 40
23	1	32	53	3	32	290	19 20
24	1	36	54	3	36	300	20 0
25	1	40	55	3	40	310	20 40
26	1	44	56	3	44	320	21 20
27	1	48	57	3	48	330	22 0
28	1	52	58	3	52	340	22 40
29	1	56	59	3	56	350	23 20
30	2	0	60	4	0	360	24 0

EXPLANATION OF THE PRECEDING TABLES.

EXAMPLE I.

Required the degrees, &c· answering to 3h. 18′ 56″?

3 hours in column first, Table XII.	= 45°	0′	in column second.
18 minutes in column third	= 4	30	in column fourth.
56 seconds in column fifth	=	14	in column sixth.
Hence 3h 18′ 56″	= 49	44	

EXAMPLE II.

What time answers to 76° 50′ 45″?

70 degrees in column fifth, Table XIII.	= 4h.	40′	0″	in col. sixth.
6 degrees in column first	=	24	0	in col. second.
50 minutes in column third	=	3	20	in col. fourth.
45 seconds in column third	=		3	in col. fourth.
Hence 76° 50′ 45″	= 5	7	23	

TABLE XIV.

To reduce the time of the Moon's passage over the Meridian of Greenwich, to the time of its passage over any other Meridian.

Arg. Time from ☽ Transit.		Arg. Daily Retardation of the Moon's passing the Meridian.														Arg. Long.
		40′	42′	44′	46′	48′	50′	52′	54′	56′	58′	60′	62′	64′	66′	
0h	0′	0′	0′	0′	0′	0′	0′	0′	0′	0′	0′	0′	0′	0′	0′	0°
0	20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5
0	40	1	1	1	1	1	1	1	1	1	2	2	2	2	2	10
1	0	2	2	2	2	2	2	2	2	2	2	2	2	3	3	15
1	20	2	2	2	2	3	3	3	3	3	3	3	3	3	4	20
1	40	3	3	3	3	3	3	3	4	4	4	4	4	4	4	25
2	0	3	3	4	4	4	4	4	4	4	5	5	5	5	5	30
2	20	4	4	4	4	5	5	5	5	5	5	6	6	6	6	35
2	40	4	4	5	5	5	5	6	6	6	6	6	7	7	7	40
3	0	5	5	5	6	6	6	6	7	7	7	7	7	8	8	45
3	20	5	6	6	6	6	7	7	7	7	8	8	8	9	9	50
3	40	6	6	7	7	7	7	8	8	8	9	9	9	9	10	55
4	0	6	7	7	7	8	8	8	9	9	9	10	10	10	11	60
4	20	7	7	8	8	8	9	9	9	10	10	10	11	11	11	65
4	40	7	8	8	9	9	9	10	10	10	11	11	12	12	12	70
5	0	8	9	9	9	10	10	10	11	11	12	12	12	13	13	75
5	20	9	9	9	10	10	11	11	12	12	12	13	13	14	14	80
5	40	9	10	10	10	11	11	12	12	13	13	14	14	14	15	85
6	0	10	10	11	11	12	12	13	13	13	14	14	15	15	16	90
6	20	10	11	11	12	12	13	13	14	14	15	15	16	16	17	95
6	40	11	11	12	12	13	13	14	14	15	15	16	17	17	18	100
7	0	11	12	12	13	14	14	15	15	16	16	17	17	18	18	105
7	20	12	12	13	14	14	15	15	16	16	17	18	18	19	19	110
7	40	12	13	14	14	15	15	16	17	17	18	18	19	20	20	115
8	0	13	14	14	15	15	16	17	17	18	19	19	20	20	21	120
8	20	13	14	15	15	16	17	17	18	19	19	20	21	21	22	125
8	40	14	15	15	16	17	17	18	19	19	20	21	21	22	23	130
9	0	14	15	16	17	17	18	19	20	20	21	22	22	23	24	135
9	20	15	16	17	17	18	19	20	20	21	22	22	23	24	25	140
9	40	15	16	17	18	19	19	20	21	22	22	23	24	25	25	145
10	0	16	17	18	19	19	20	21	22	22	23	24	25	26	26	150
10	20	16	18	18	19	20	21	22	22	23	24	25	26	26	27	155
10	40	17	18	19	20	21	21	22	23	24	25	26	26	27	28	160
11	0	17	19	20	20	21	22	23	24	25	26	26	27	28	29	165
11	20	18	19	20	21	22	23	24	25	25	26	27	28	29	30	170
11	40	18	20	21	22	23	23	24	25	26	27	28	29	30	31	175
12	0	19	20	21	22	23	24	25	26	27	28	29	30	31	32	180

TABLE XV.

Altitude to be observed, in order to ascertain the Apparent Time with the greatest accuracy.

Arg. Latitude.	Arg. Declination of the Sun or Star. 2°		4°		6°		8°		10°		12°		14°		16°		18°		20°		22°		24°	
°	°	′	°	′	°	′	°	′	°	′	°	′	°	′	°	′	°	′	°	′	°	′	°	′
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	30	1	14	29	9	37	7	12	5	46	4	49	4	8	3	38	3	14	2	55	2	40	2	28
2	90	0	30	1	19	30	14	31	11	36	9	40	8	18	7	17	6	29	5	52	5	21	4	55
3	41	49	48	37	30	3	22	5	17	32	14	35	12	30	10	57	9	45	8	48	8	2	7	24
4	30	1	90	0	41	52	30	5	23	41	19	36	16	45	14	40	13	3	11	46	10	44	9	53
5	23	36	53	10	56	30	38	46	30	8	24	47	21	7	18	26	16	23	14	46	13	27	12	22
6	19	30	41	52	90	0	48	40	40	9	30	11	25	36	22	17	19	46	17	48	16	12	14	53
7	16	38	34	55	59	4	61	7	44	34	35	53	30	15	26	14	23	14	20	52	18	59	17	26
8	14	31	30	5	48	41	90	0	53	16	42	1	35	7	30	20	26	46	24	1	21	48	20	1
9	12	23	26	29	41	56	62	50	64	16	48	48	40	17	34	35	30	25	27	13	24	41	22	37
10	11	35	23	41	37	0	53	17	90	0	56	38	45	52	39	3	34	11	30	30	27	37	25	16
11	10	32	21	27	33	13	46	50	65	31	69	36	52	4	43	48	38	8	33	55	30	47	27	59
12	9	40	19	36	30	11	42	2	56	39	90	0	59	15	48	58	42	17	37	26	33	42	30	44
13	8	55	18	4	27	41	38	13	50	32	67	33	68	25	54	42	46	43	41	8	36	54	33	35
14	8	18	16	45	25	86	35	7	45	53	59	15	90	0	61	22	51	31	45	1	40	13	36	30
15	7	45	15	38	23	49	32	32	42	8	53	27	69	11	69	53	56	53	49	11	43	43	39	31
16	7	16	14	40	22	17	30	20	39	4	48	59	61	23	90	0	63	6	50	12	47	22	42	39
17	6	51	13	48	20	57	28	26	36	26	45	20	55	50	70	31	71	7	58	44	51	18	45	57
18	6	29	13	3	19	46	26	46	34	11	42	17	51	32	63	8	90	0	64	37	55	34	49	26
19	6	9	12	22	18	44	25	18	32	14	39	41	48	0	57	51	71	39	72	9	60	21	53	10
20	5	51	11	46	17	48	24	1	30	31	37	27	45	2	53	43	64	40	90	0	65	54	57	13
21	5	35	11	13	16	57	22	51	28	59	35	28	42	28	50	17	59	34	72	37	73	4	61	46
22	5	21	10	44	16	12	21	49	27	37	33	43	40	14	47	22	55	35	65	56	90	0	67	5
23	5	7	10	17	15	31	20	52	26	23	32	9	38	15	44	52	52	16	61	5	73	29	73	52
24	4	55	9	53	14	53	20	1	25	17	30	45	36	30	42	40	49	27	57	15	67	6	90	0
25	4	44	9	30	14	19	19	14	24	16	29	28	34	55	40	43	46	59	54	2	62	25	74	14
26	4	34	9	9	13	48	18	31	23	21	28	19	33	30	38	58	44	50	51	18	58	44	68	7
27	4	25	8	50	13	19	17	51	22	29	27	15	32	12	37	23	42	54	48	53	55	36	63	37

Latitude.	2°		4°		6°		8°		10°		12°		14°		16°		18°		20°		22°		24°	
28	4	16	8	33	12	52	17	15	21	43	26	17	31	1	35	57	41	10	46	47	52	57	60	3
29	4	8	8	16	12	27	16	41	20	59	25	23	29	56	34	39	39	36	44	55	50	37	57	2
30	4	0	8	1	12	4	16	10	20	19	24	34	28	56	33	57	38	11	43	10	48	32	54	26
31	3	53	7	47	11	43	15	41	19	42	23	48	28	1	32	21	36	52	41	37	46	40	52	9
32	3	47	7	34	11	23	15	14	19	8	23	6	27	10	31	20	35	41	40	12	45	0	50	8
33	3	40	7	22	11	4	14	48	18	36	22	26	26	22	30	24	34	34	38	54	43	27	48	19
34	3	35	7	10	10	46	14	25	18	8	21	50	25	38	29	32	33	33	37	43	42	4	46	40
35	3	29	6	59	10	30	14	3	17	37	21	15	24	57	28	43	32	36	36	36	40	47	45	10
36	3	24	6	49	10	15	13	42	17	11	20	43	24	18	27	58	31	43	35	35	39	36	43	48
37	3	19	6	39	10	0	13	22	16	46	20	12	23	42	27	16	30	54	34	38	38	30	42	31
38	3	15	6	31	9	47	13	4	16	23	19	44	23	9	26	36	30	8	33	45	37	29	41	22
39	3	11	6	22	9	34	12	47	16	1	19	17	22	36	25	59	29	24	32	55	36	32	40	16
40	3	7	6	14	9	21	12	30	15	40	18	52	22	7	25	24	28	44	32	9	35	39	39	15
42	2	59	5	59	8	59	11	59	15	3	18	6	22	12	24	20	27	30	30	45	34	3	37	26
44	2	53	5	46	8	39	11	33	14	29	17	25	20	23	23	23	26	25	29	30	32	38	35	50
46	2	47	5	34	8	21	11	10	13	58	16	48	19	39	22	32	25	27	28	24	31	23	34	26
48	2	41	5	23	8	5	10	48	13	31	16	15	19	0	21	46	24	34	27	27	30	16	33	11
50	2	36	5	13	7	50	10	28	13	6	15	45	18	25	21	5	23	48	26	32	29	17	32	4
52	2	32	5	5	7	37	10	11	12	44	15	18	17	53	20	29	23	6	25	44	28	23	31	5
54	2	28	4	57	7	25	9	54	12	24	14	53	17	24	19	55	22	28	25	1	27	35	30	11
56	2	25	4	50	7	14	9	40	12	6	14	32	16	58	19	25	21	53	24	22	26	52	29	23
58	2	22	4	43	7	4	9	27	11	49	14	12	16	35	18	58	21	22	23	47	26	13	28	40
60	2	19	4	37	6	56	9	15	11	34	13	54	16	15	18	33	20	54	23	16	25	38	28	1
62	2	16	4	31	6	48	9	4	11	21	13	37	15	54	18	12	20	30	22	48	25	7	27	26
64	2	14	4	27	6	41	8	53	11	9	13	23	15	37	17	53	20	7	22	22	24	38	26	54
66	2	12	4	22	6	34	8	44	10	58	13	10	15	22	17	34	19	46	22	0	24	13	26	26
68	2	9	4	19	6	28	8	37	10	48	12	58	15	8	17	18	19	28	21	39	23	50	26	1
70	2	8	4	15	6	23	8	31	10	39	12	47	14	55	17	3	19	12	21	21	23	30	25	39
72	2	6	4	12	6	19	8	25	10	31	12	38	14	44	16	51	18	54	21	5	23	12	25	19
74	2	5	4	9	6	15	8	20	10	25	12	30	14	35	16	40	18	45	20	51	22	56	25	2
76	2	4	4	7	6	11	8	15	10	19	12	23	14	27	16	30	18	24	20	39	22	43	24	47
78	2	3	4	5	6	8	8	11	10	14	12	16	14	19	16	22	18	25	20	29	22	31	24	34
80	2	2	4	4	6	5	8	8	10	10	12	11	14	14	16	15	18	17	20	20	22	22	24	24

Declination of the Object.

TABLE XVI.

For reducing the Sun's Declination to any given Meridian, and to any Time under that Meridian.

When Sun's dec. is increasing, { Add in W. lon. } Sub. in E. lon. } Add aft. noon. } Sub. bef. noon. | When Sun's dec. is decreasing. { Sub. in W. lon. } Add in E. lon. } Sub. aft. noon. } Add bef. noon.

Long.	Sun's Declination. 0°	2°	4°	6°	8°	9°	10°	11°	12°	13°	14°	15°	Time fr. No on.
0°	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0h 0m
3	0 12	0 12	0 12	0 11	0 11	0 11	0 11	0 11	0 10	0 10	0 9	0 9	0 12
6	0 24	0 24	0 24	0 23	0 23	0 22	0 22	0 21	0 20	0 20	0 18	0 18	0 24
9	0 35	0 35	0 35	0 34	0 34	0 33	0 32	0 32	0 31	0 30	0 28	0 27	0 36
12	0 47	0 47	0 47	0 46	0 45	0 44	0 43	0 42	0 41	0 40	0 38	0 37	0 48
15	0 59	0 59	0 58	0 57	0 56	0 55	0 54	0 53	0 51	0 50	0 48	0 46	1 0
18	1 11	1 10	1 10	1 9	1 7	1 6	1 5	1 3	1 1	1 0	0 58	0 55	1 12
21	1 22	1 22	1 22	1 21	1 18	1 17	1 16	1 14	1 12	1 9	1 7	1 5	1 24
24	1 34	1 34	1 33	1 32	1 29	1 28	1 27	1 24	1 22	1 19	1 17	1 14	1 36
27	1 46	1 45	1 44	1 43	1 41	1 39	1 38	1 35	1 32	1 29	1 27	1 23	1 48
30	1 58	1 57	1 56	1 54	1 51	1 49	1 48	1 45	1 43	1 39	1 36	1 32	2 0
33	2 10	2 10	2 8	2 6	2 3	2 1	1 59	1 55	1 53	1 49	1 46	1 42	2 12
36	2 22	2 21	2 19	2 17	2 14	2 12	2 10	2 6	2 3	1 59	1 56	1 51	2 24
39	2 33	2 32	2 31	2 29	2 25	2 23	2 20	2 16	2 14	2 9	2 5	2 1	2 36
42	2 45	2 44	2 43	2 40	2 36	2 34	2 31	2 27	2 24	2 19	2 15	2 10	2 48
45	2 57	2 56	2 54	2 51	2 47	2 44	2 41	2 38	2 34	2 29	2 24	2 19	3 0
48	3 9	3 8	3 6	3 3	2 59	2 55	2 52	2 49	2 44	2 39	2 34	2 28	3 12
51	3 20	3 19	3 18	3 15	3 10	3 6	3 3	3 0	2 55	2 49	2 44	2 38	3 24
54	3 32	3 31	3 30	3 26	3 21	3 17	3 14	3 10	3 5	2 59	2 53	2 47	3 36
57	3 43	3 42	3 41	3 37	3 32	3 28	3 25	3 21	3 15	3 9	3 3	2 56	3 48
60	3 55	3 54	3 52	3 48	3 43	3 39	3 35	3 31	3 25	3 19	3 13	3 5	4 0
63	4 7	4 6	4 4	4 0	3 54	3 50	3 46	3 42	3 35	3 29	3 22	3 14	4 12
66	4 19	4 18	4 16	4 12	4 5	4 1	3 57	3 52	3 46	3 39	3 32	3 23	4 24
69	4 31	4 30	4 27	4 23	4 16	4 12	4 8	4 3	3 56	3 49	3 42	3 32	4 36
72	4 43	4 42	4 39	4 34	4 27	4 23	4 19	4 13	4 6	3 59	3 51	3 41	4 48
75	4 54	4 53	4 50	4 45	4 38	4 34	4 29	4 23	4 16	4 9	4 1	3 51	5 0
78	5 6	5 5	5 2	4 57	4 50	4 45	4 40	4 34	4 27	4 19	4 11	4 0	5 12

k													
81	5 18	5 17	5 14	5 9	5 1	4 50	4 51	4 44	4 37	4 29	4 20	4 9	5 24
84	5 30	5 28	5 26	5 20	5 12	5 7	5 2	4 55	4 47	4 39	4 30	4 18	5 36
87	5 41	5 40	5 37	5 31	5 23	5 18	5 13	5 5	4 58	4 49	4 40	4 27	5 48
90	5 53	5 52	5 48	5 42	5 34	5 29	5 23	5 16	5 8	4 59	4 49	4 37	6 0
93	6 5	6 4	6 0	5 54	5 46	5 41	5 34	5 27	5 18	5 9	4 59	4 46	6 12
96	6 17	6 15	6 12	6 6	5 57	5 52	5 45	5 37	5 28	5 19	5 9	4 55	6 24
99	6 28	6 27	6 23	6 17	6 8	6 3	5 56	5 48	5 39	5 29	5 18	5 5	6 36
102	6 40	6 39	6 35	6 28	6 19	6 14	6 7	5 58	5 49	5 39	5 28	5 14	6 48
105	6 52	6 51	6 46	6 39	6 30	6 24	6 17	6 9	5 59	5 49	5 37	5 23	7 0
108	7 4	7 2	6 58	6 51	6 41	6 35	6 28	6 19	6 9	5 59	5 47	5 32	7 12
111	7 15	7 14	7 10	7 3	6 52	6 46	6 39	6 30	6 20	6 9	5 56	5 42	7 24
114	7 27	7 26	7 22	7 15	7 3	6 57	6 50	6 40	6 30	6 19	6 6	5 51	7 36
117	7 39	7 37	7 33	7 26	7 14	7 8	7 1	6 51	6 40	6 29	6 15	6 1	7 48
120	7 51	7 49	7 44	7 37	7 25	7 18	7 11	7 1	6 51	6 39	6 25	6 10	8 0
123	8 3	8 1	7 56	7 49	7 37	7 29	7 22	7 12	7 1	6 49	6 35	6 19	8 12
126	8 14	8 13	8 8	8 0	7 48	7 40	7 33	7 22	7 11	6 59	6 44	6 28	8 24
129	8 26	8 24	8 20	8 11	7 59	7 51	7 43	7 33	7 22	7 9	6 54	6 37	8 36
132	8 38	8 36	8 31	8 22	8 10	8 2	7 54	7 43	7 32	7 18	7 4	6 46	8 48
135	8 50	8 48	8 42	8 33	8 21	8 13	8 4	7 54	7 42	7 28	7 13	6 56	9 0
138	9 1	8 59	8 54	8 45	8 33	8 24	8 15	8 5	7 52	7 38	7 23	7 5	9 12
141	9 13	9 11	9 6	8 57	8 44	8 35	8 26	8 15	8 3	7 48	7 33	7 14	9 24
144	9 25	9 23	9 18	9 8	8 55	8 46	8 37	8 26	8 13	7 58	7 42	7 23	9 36
147	9 37	9 35	9 29	9 19	9 6	8 57	8 48	8 36	8 23	8 8	7 52	7 32	9 48
150	9 48	9 45	9 40	9 30	9 17	9 8	8 58	8 47	8 33	8 18	8 2	7 42	10 0
153	10 0	9 57	9 52	9 42	9 28	9 19	9 9	8 57	8 43	8 28	8 12	7 51	10 12
156	10 12	10 9	10 4	9 54	9 39	9 30	9 20	9 8	8 54	8 38	8 21	8 0	10 24
159	10 24	10 21	10 16	10 5	9 50	9 41	9 31	9 18	9 4	8 48	8 31	8 10	10 36
162	10 36	10 33	10 27	10 16	10 1	9 52	9 42	9 29	9 14	8 58	8 41	8 19	10 48
165	10 47	10 44	10 38	10 27	10 12	10 3	9 52	9 39	9 24	9 8	8 50	8 28	11 0
168	10 59	10 56	10 50	10 39	10 24	10 14	10 3	9 50	9 35	9 18	9 0	8 38	11 12
171	11 11	11 8	11 2	10 51	10 35	10 25	10 14	10 0	9 45	9 28	9 10	8 47	11 24
174	11 23	11 20	11 14	11 3	10 46	10 36	10 25	10 11	9 55	9 38	9 19	8 57	11 36
177	11 34	11 31	11 25	11 14	10 57	10 47	10 36	10 21	10 6	9 48	9 29	9 6	11 48
180	11 46	11 43	11 37	11 25	11 8	10 58	10 46	10 32	10 16	9 58	9 38	9 15	12 0

TABLE XVI.

For reducing the Sun's Declination to any given Meridian, and to any Time under that Meridian.

When Sun's dec. is increasing,	Add in W. lon. / Sub. in E. lon.	Add aft. noon. / Sub. bef. noon.	When Sun's dec. is decreasing.	Sub. in W. lon. / Add in E. lon.	Sub. aft. noon. / Add bef. noon.

Long.	Sun's Declination.														Time fr. Noon.
	16°	17°	18°	19°	19° 30′	20°	20° 30′	21°	21° 30′	22°	22° 30′	23°	23° 15′	23° 28′	
0°	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0′ 0″	0h 0m
3	0 9	0 8	0 8	0 7	0 7	0 6	0 6	0 5	0 5	0 4	0 3	0 2	0 2	0 0	0 12
6	0 18	0 16	0 16	0 14	0 13	0 12	0 11	0 10	0 9	0 8	0 6	0 4	0 4	0 0	0 24
9	0 27	0 24	0 24	0 21	0 20	0 18	0 17	0 15	0 14	0 12	0 10	0 7	0 5	0 0	0 36
12	0 36	0 32	0 31	0 28	0 27	0 25	0 23	0 21	0 19	0 16	0 14	0 9	0 7	0 0	0 48
15	0 44	0 41	0 39	0 35	0 34	0 32	0 29	0 27	0 24	0 21	0 18	0 12	0 9	0 0	1 0
18	0 53	0 49	0 46	0 42	0 40	0 38	0 35	0 32	0 29	0 25	0 21	0 14	0 10	0 0	1 12
21	1 2	0 57	0 54	0 49	0 47	0 44	0 41	0 38	0 34	0 29	0 24	0 17	0 12	0 0	1 24
24	1 11	1 5	1 2	0 56	0 54	0 50	0 47	0 44	0 39	0 34	0 28	0 19	0 14	0 0	1 36
27	1 20	1 14	1 10	1 3	0 1	0 57	0 53	0 50	0 44	0 39	0 32	0 22	0 15	0 0	1 48
30	1 28	1 23	1 18	1 11	1 8	1 4	0 59	0 55	0 49	0 43	0 36	0 25	0 17	0 0	2 0
33	1 37	1 31	1 25	1 18	1 14	1 10	1 4	1 0	0 53	0 47	0 39	0 27	0 19	0 0	2 12
36	1 46	1 39	1 33	1 25	1 21	1 16	1 10	1 5	0 58	0 51	0 42	0 30	0 20	0 0	2 24
39	1 55	1 47	1 41	1 32	1 28	1 22	1 16	1 10	1 3	0 55	0 46	0 32	0 22	0 0	2 36
42	2 4	1 56	1 49	1 39	1 35	1 29	1 22	1 16	1 8	0 59	0 50	0 34	0 24	0 0	2 48
45	2 12	2 5	1 57	1 46	1 42	1 36	1 28	1 22	1 13	1 4	0 54	0 36	0 25	0 0	3 0
48	2 21	2 13	2 4	1 53	1 48	1 42	1 33	1 27	1 18	1 8	0 57	0 39	0 27	0 0	3 12
51	2 30	2 21	2 12	2 0	1 55	1 48	1 39	1 32	1 23	1 12	1 0	0 42	0 29	0 0	3 24
54	2 39	2 29	2 20	2 7	2 2	1 54	1 45	1 38	1 28	1 16	1 3	0 44	0 30	0 0	3 36
57	2 48	2 38	2 28	2 15	2 9	2 1	1 52	1 44	1 33	1 21	1 7	0 47	0 32	0 0	3 48
60	2 56	2 47	2 36	2 23	2 16	2 8	1 59	1 49	1 39	1 26	1 11	0 49	0 34	0 0	4 0
63	3 5	2 55	2 43	2 29	2 22	2 14	2 4	1 54	1 43	1 30	1 14	0 51	0 35	0 0	4 12
66	3 14	3 3	2 51	2 36	2 29	2 20	2 10	1 59	1 48	1 34	1 17	0 54	0 37	0 0	4 24
69	3 23	3 11	2 59	2 43	2 36	2 26	2 16	2 4	1 53	1 38	1 21	0 56	0 39	0 0	4 36
72	3 32	3 19	3 7	2 50	2 43	2 33	2 21	2 10	1 58	1 42	1 25	0 59	0 40	0 0	4 48
75	3 40	3 28	3 15	2 58	2 50	2 40	2 27	2 16	2 3	1 47	1 29	1 1	0 42	0 0	5 0
78	3 49	3 36	3 22	3 5	2 56	2 46	2 33	2 21	2 8	1 51	1 32	1 4	0 44	0 0	5 12

81	3 58	3 44	3 30	3 12	3 3	2 52	2 39	2 26	2 13	1 55	1 35	1 6	0 45	0 0	5 24
84	4 7	3 52	3 38	3 19	3 10	2 58	2 45	2 32	2 18	1 59	1 39	1 9	0 47	0 0	5 36
87	4 16	4 1	3 46	3 26	3 17	3 5	2 52	2 38	2 23	2 4	1 43	1 11	0 49	0 0	5 48
90	4 25	4 10	3 54	3 34	3 24	3 12	2 59	2 44	2 28	2 9	1 47	1 14	0 50	0 0	6 0
93	4 34	4 18	4 1	3 41	3 30	3 18	3 4	2 49	2 32	2 13	1 50	1 16	0 52	0 0	6 12
96	4 43	4 26	4 9	3 48	3 37	3 24	3 9	2 54	2 37	2 17	1 53	1 19	0 54	0 0	6 24
99	4 52	4 34	4 17	3 55	3 44	3 30	3 15	2 59	2 42	2 21	1 57	1 21	0 55	0 0	6 36
102	5 0	4 43	4 25	4 2	3 51	3 37	3 21	3 5	2 47	2 25	2 1	1 24	0 57	0 0	6 48
105	5 8	4 52	4 33	4 9	3 58	3 44	3 27	3 11	2 52	2 30	2 5	1 26	0 59	0 0	7 0
108	5 17	5 0	4 40	4 16	4 4	3 50	3 33	3 16	2 57	2 34	2 9	1 29	1 0	0 0	7 12
111	5 26	5 8	4 48	4 23	4 11	3 56	3 39	3 21	3 2	2 38	2 12	1 31	1 2	0 0	7 24
114	5 35	5 16	4 56	4 30	4 18	4 2	3 46	3 27	3 7	2 43	2 16	1 34	1 4	0 0	7 36
117	5 44	5 25	5 4	4 38	4 25	4 9	3 52	3 33	3 12	2 48	2 20	1 37	1 5	0 0	7 48
120	5 53	5 34	5 12	4 46	4 32	4 16	3 59	3 39	3 17	2 53	2 23	1 39	1 7	0 0	8 0
123	6 2	5 42	5 19	4 53	4 38	4 22	4 4	3 44	3 22	2 57	2 26	1 41	1 9	0 0	8 12
126	6 11	5 50	5 27	5 0	4 45	4 28	4 10	3 49	3 27	3 1	2 29	1 44	1 10	0 0	8 24
129	6 19	5 58	5 35	5 7	4 52	4 34	4 16	3 54	3 32	3 5	2 33	1 46	1 12	0 0	8 36
132	6 28	6 6	5 43	5 14	4 59	4 41	4 22	3 59	3 37	3 9	2 36	1 49	1 14	0 0	8 48
135	6 36	6 15	5 51	5 21	5 6	4 48	4 28	4 5	3 42	3 13	2 40	1 51	1 15	0 0	9 0
138	6 45	6 23	5 58	5 28	5 12	4 54	4 34	4 10	3 47	3 17	2 43	1 54	1 17	0 0	9 12
141	6 54	6 31	6 6	5 35	5 19	5 0	4 40	4 15	3 52	3 21	2 46	1 56	1 19	0 0	9 24
144	7 3	6 39	6 14	5 42	5 26	5 6	4 46	4 21	3 57	3 26	2 50	1 59	1 20	0 0	9 36
147	7 12	6 48	6 22	5 49	5 33	5 13	4 52	4 27	4 2	3 30	2 54	2 1	1 22	0 0	9 48
150	7 21	6 57	6 30	5 57	5 40	5 20	4 58	4 33	4 7	3 35	2 58	2 4	1 24	0 0	10 0
153	7 30	7 5	6 37	6 4	5 46	5 26	5 3	4 38	4 11	3 39	3 1	2 6	1 25	0 0	10 12
156	7 39	7 13	6 45	6 11	5 53	5 32	5 9	4 43	4 16	3 43	3 4	2 9	1 27	0 0	10 24
159	7 48	7 21	6 53	6 18	6 0	5 38	5 15	4 48	4 21	3 47	3 8	2 11	1 29	0 0	10 36
162	7 57	7 29	7 1	6 25	6 7	5 45	5 21	4 54	4 26	3 51	3 12	2 13	1 30	0 0	10 48
165	8 5	7 38	7 9	6 32	6 14	5 52	5 26	5 0	4 31	3 56	3 16	2 15	1 32	0 0	11 0
168	8 14	7 46	7 16	6 39	6 20	5 58	5 32	5 6	4 36	4 0	3 19	2 17	1 34	0 0	11 12
171	8 23	7 54	7 24	6 46	6 27	6 4	5 38	5 11	4 41	4 4	3 22	2 20	1 35	0 0	11 24
174	8 32	8 3	7 32	6 53	6 34	6 10	5 44	5 17	4 46	4 9	3 26	2 22	1 37	0 0	11 36
177	8 41	8 12	7 40	7 1	6 41	6 17	5 51	5 23	4 51	4 14	3 30	2 25	1 39	0 0	11 48
180	8 49	8 21	7 48	7 9	6 48	6 24	5 58	5 29	4 56	4 19	3 34	2 28	1 40	0 0	12 0

[illegible] the declination and longitude, or time from noon, are not nearly found in the table, proportional parts must be used, if great exactness is required.

TABLE XVII.

The following true distances are found [from the apparent distances and altitudes given] by Witchell's Method Angle A, and by the method of the author of this work, the results of which will be seen, on reference to the following columns of true distances.

Apparent Distance.	☉ Appt. Alt.	☽ Appt. Alt.	Hor. Parallax.	True Distance by Witchell.	True Distance by this Work.
° ′ ″	° ′	° ′	′ ″	° ′ ″	° ′ ″
46 25 23	15 2	61 21	60 27	46 57 5	46 57 3
72 36 13	56 20	49 48	59 09	72 00 6	72 00 3
111 0 2	36 30	31 51	56 45	110 15 2	110 15 4
72 31 9	47 43	53 51	57 58	72 2 15	72 2 15
59 41 56	44 27	66 26	58 51	59 26 50	59 26 48
40 27 33	73 12	34 21	60 27	39 39 32	39 39 33
54 13 1	73 27	22 58	59 36	53 21 22	53 21 23
68 50 45	32 28	55 13	58 27	68 37 7	68 37 7
114 47 16	18 3	46 14	56 15	114 12 57	114 12 55
50 19 55	6 39	33 58	58 38	50 42 45	50 42 44
62 52 46	10 26	38 22	57 40	63 2 21	63 2 19
74 48 25	20 33	33 11	56 49	74 37 52	74 37 53
49 9 36	23 4	68 11	54 14	49 26 47	49 26 46
56 44 12	40 3	70 52	54 30	56 37 9	56 37 10
45 10 46	28 21	53 3	57 25	45 19 7	45 19 9
114 43 57	11 11	52 13	54 17	114 17 46	114 17 45
40 58 40	36 47	39 29	59 38	40 48 53	40 48 50
62 6 47	36 52	77 22	55 7	61 59 10	61 59 7
95 35 2	28 28	55 26	54 23	95 6 52	95 6 53
74 57 19	40 29	51 59	54 32	74 33 40	74 33 40
64 8 43	32 38	66 5	54 21	64 1 37	64 1 37
66 18 55	34 44	19 56	58 8	65 53 4	65 53 1
91 50 11	50 20	33 37	59 12	91 5 32	91 5 31
65 52 17	37 16	49 7	54 25	65 35 52	65 35 49
59 3 59	19 59	39 47	58 06	59 4 43	59 4 41
93 59 26	36 24	41 5	57 30	93 24 33	93 24 33
105 41 3	16 35	52 8	58 25	105 14 16	105 14 14
68 39 3	23 45	64 7	56 00	68 36 27	68 36 27
78 8 24	20 4	18 23	58 40	77 53 19	77 53 17
103 46 50	19 29	9 26	59 30	103 26 45	103 26 47
68 56 4	45 28	31 7	59 38	68 23 52	68 23 51
80 37 20	37 52	11 58	54 29	80 8 10	80 8 8
114 24 41	32 45	19 17	54 43	113 47 2	113 47 01
60 10 42	36 51	9 41	58 50	59 38 54	59 38 51
82 8 48	31 59	56 18	54 26	81 47 41	81 47 40
92 22 52	45 14	25 39	54 38	91 45 16	91 45 13
120 1 41	47 55	8 28	59 35	119 12 4	119 12 4
90 18 41	31 14	57 3	58 31	89 50 6	89 50 5
70 13 55	9 30	55 17	54 24	70 24 47	70 24 45
72 2 50	49 9	19 16	58 28	71 24 46	71 24 43
86 34 36	34 46	52 22	59 1	86 5 27	86 5 27
98 54 58	47 7	17 3	57 20	98 12 48	98 12 46
99 6 29	58 35	18 56	58 58	98 15 36	98 15 33
68 51 41	66 12	22 34	56 10	68 7 4	68 7 2
78 20 36	28 17	59 22	59 13	78 4 16	78 4 14
[illegible]7 50 6	29 34	23 54	56 40	77 28 2	77 28 4
[illegible] 49 43	24 36	29 41	57 35	65 37 34	65 37 34

TABLE XVII.

Examples in which the Star is used.

Apparent Distance.	✱ Apparent Alt.	☽ Appt. Alt.	Hor. Parallax.	True Distance by Witchell.	True Distance by this work.
° ′ ″	° ′	° ′	′ ″	° ′ ″	° ′ ″
75 13 7	51 20	50 40	55 57	74 40 50	74 40 52
65 50 1	42 6	51 7	55 15	65 30 1	65 30 3
50 4 6	27 7	40 50	54 42	50 2 46	50 2 48
38 40 4	41 16	52 6	54 18	38 37 12	38 37 14
37 11 31	44 01	51 2	54 2	37 5 37	37 5 37
49 7 50	51 06	50 4	54 3	48 49 2	48 49 2
61 4 6	31 17	41 50	54 10	60 53 13	60 53 15
35 4 7	36 10	42 40	54 23	35 1 43	35 1 41
47 37 6	45 50	21 06	54 42	47 3 38	47 3 37
34 4 20	42 17	22 17	55 4	33 30 29	33 30 29
58 9 10	51 16	31 15	55 29	57 37 27	57 37 26
56 7 25	27 50	41 16	55 00	56 2 8	56 2 10
43 40 50	28 09	45 17	55 58	43 45 27	43 45 27
41 6 21	29 18	47 20	56 29	41 13 4	41 13 3
64 7 50	39 40	29 40	56 50	63 42 31	63 42 29
40 50 11	61 50	41 50	57 2	40 18 13	40 18 14
52 6 7	21 6	31 5	57 41	52 4 19	52 4 21
51 6 27	41 6	32 6	58 19	50 43 22	50 43 22
28 9 50	52 17	42 10	58 56	27 45 52	27 45 50
39 40 51	31 17	41 8	59 31	39 40 43	39 40 43
51 6 54	51 6	31 7	60 1	50 33 13	50 33 14
42 37 6	21 10	41 6	60 29	42 49 35	42 49 36
82 2 53	41 7	51 8	60 00	81 31 16	81 31 16
41 6 27	21 6	51 10	59 25	41 28 50	41 28 53
37 50 4	51 17	21 18	58 20	37 4 55	37 4 53
29 50 1	41 50	22 6	57 47	29 11 54	29 11 54
40 50 40	40 5	42 6	56 54	40 39 44	40 39 47
66 7 20	52 17	51 51	54 43	65 40 19	65 40 21
63 7 50	53 50	50 16	55 16	62 40 32	62 40 33
62 8 20	25 25	45 55	56 17	62 3 57	62 3 54
42 52 6	60 40	25 50	60 00	42 4 54	42 4 54
41 51 7	50 6	27 8	61 4	41 13 20	41 13 19
40 21 6	41 20	21 10	60 5	39 46 54	39 46 53
39 4 7	21 6	31 6	59 10	39 9 16	39 9 16
38 41 8	22 40	51 4	59 1	39 3 39	39 3 40
37 6 4	21 50	54 18	58 50	37 34 41	37 34 40
35 7 40	20 40	56 7	58 9	55 18 20	55 18 21

III. APRIL, 1817.

Days.		Sun's semidiameter. M.	S.
1	———	16	1.2
7	———	15	59.5
13	———	15	57.9
19	———	15	56.3
25	———	15	54.8
30	———	15	53.4

VII. APRIL, 1817.

Days of the Week.	Days of the Month.	THE MOON'S Semidiameter. Noon. M.	S.	Midnight M.	S.	Hor. Parallax. Noon. M.	S.	Midnight M.	S.	Proportional Logarithm. Noon.	Midnight
Tu.	1	16	41	16	43	61	9	61	16	4689	4680
W.	2	16	44	16	43	61	19	61	17	4677	4679
Th.	3	16	41	16	38	61	10	60	58	4688	4702
F.	4	16	34	16	29	60	42	60	23	4721	4744
Sa.	5	16	23	16	16	60	1	59	37	4770	4799
Sun.	6	16	9	16	2	59	12	58	45	4830	4863
M.	7	15	55	15	47	58	18	57	51	4896	4930
Tu.	8	15	40	15	33	57	25	57	0	4962	4994
W.	9	15	27	15	21	56	36	56	14	5025	5053
Th.	10	15	15	15	10	55	53	55	34	5080	5105
F.	11	15	5	15	1	55	17	55	2	5127	5146
Sa.	12	14	57	14	54	54	48	54	36	5165	5181
Sun.	13	14	51	14	49	54	26	54	17	5194	5206
M.	14	14	47	14	45	54	10	54	4	5215	5223
Tu.	15	14	44	14	43	54	0	53	7	5229	5300
W.	16	14	43	14	43	53	55	53	55	5235	5235
Th.	17	14	43	14	44	53	56	53	58	5234	5231
F.	18	14	45	14	46	54	2	54	7	5226	5219
Sa.	19	14	48	14	50	54	14	54	22	5210	5199
Sun.	20	14	53	14	56	54	32	54	44	5186	5170
M.	21	15	0	15	4	54	58	55	13	5152	5132
Tu.	22	15	9	15	14	55	30	55	49	5110	5085
W.	23	15	20	15	26	56	10	56	33	5058	5028
Th.	24	15	33	15	40	56	58	57	24	4997	4964
F.	25	15	47	15	54	57	51	58	18	4930	4896
Sa.	26	16	2	16	10	58	45	59	12	4863	4830
Sun.	27	16	17	16	23	59	39	60	3	4797	4768
M.	28	16	29	16	35	60	25	60	45	4741	4717
Tu.	29	16	39	16	42	61	1	61	12	4698	4685
W.	30	16	44	16	45	61	19	61	21	4677	4675
May	1	16	44	16	42	61	18	61	11	4678	4686

Distances of Moon's centre from the Sun, and from Stars east of her.

Stars' Names.	Days.	Noon. D. M. S.	IIIh. D. M. S.	VIh. D. M. S.	IXh. D. M. S.	Midnight. D. M. S.	XVh. D. M. S.	XVIIIh. D. M. S.	XXIh. D. M. S.
Antares.	1	62 56 49	61 3 17	59 9 37	57 15 50	55 21 58	53 28 1	51 34 3	49 40 5
	2	47 46 5	45 52 7	43 58 14	42 4 26	40 10 43	38 17 7	36 23 42	34 30 29
	3	32 37 27	30 44 41	28 52 12	27 0 1	25 8 11			
a Aquilæ.	3	- - -	- - -	- - -	- - -	77 32 21	75 59 50	74 27 48	72 56 19
	4	71 25 27	69 55 13	68 25 45	66 57 4	65 29 9	64 2 6	62 36 4	61 11 2
	5	59 47 0	58 24 4	57 2 24	55 42 2	54 22 56	53 5 18	51 49 11	50 34 38
	6	49 21 45							
Fomalhaut.	6	72 37 40	70 56 28	69 15 45	67 35 33	65 55 51	64 16 41	62 38 3	60 59 58
	7	59 22 26	57 43 27	56 9 4	54 33 18	52 58 8	51 23 35	49 49 42	48 16 31
	8	46 44 1	45 12 16	43 41 16	42 11 3	40 41 38			
The Sun.	5	- - -	- - -	- - -	- - -	- - -	- - -	120 24 57	118 46 3
	6	117 7 32	115 29 24	113 51 42	112 14 23	110 37 29	109 0 59	107 24 54	105 49 13
	7	104 13 56	102 39 4	101 4 35	99 30 29	97 56 48	96 23 30	94 50 34	93 18 2
	8	91 45 52	90 14 5	88 42 38	87 11 33	85 40 50	84 10 28	82 40 25	81 10 42
	9	79 41 19	78 12 15	76 43 29	75 15 1	73 46 52	72 19 0	70 51 25	69 24 7
	10	67 57 5	66 30 19	65 3 47	63 37 30	62 11 28	60 45 40	59 20 6	57 54 44
	11	56 29 36	55 4 40	53 39 55	52 15 22	50 51 1	49 26 51	48 2 50	46 39 0
	12	45 15 21	43 51 51	42 28 29	41 5 17	39 42 13			

Distances of Moon's centre from Sun, and from Stars east of her.

Stars' Names.	Days.	Noon. D. M. S.	IIIh. D. M. S.	VIh. D. M. S.	IXh. D. M. S.	Midnight. D. M. S.	XVh. D. M. S.	XVIIIh. D. M. S.	XXIh. D. M. S.
Pollux.	18	62 23 28	60 54 34	59 25 37	57 56 37	56 27 35	54 58 29	53 29 19	52 0 6
	19	50 30 48	49 1 26	47 31 58	46 2 25	44 32 47	43 3 4	41 33 14	40 3 19
	20	38 33 17	37 3 8	35 32 53	34 2 30	32 32 0	31 1 23	29 30 37	27 59 44
	21	26 28 42							
Regulus.	21	62 49 41	61 18 30	59 47 8	58 15 36	56 43 54	55 12 1	53 39 55	52 7 38
	22	50 35 9	49 2 26	47 29 31	45 56 22	44 23 0	42 49 24	41 15 34	39 41 31
	23	38 7 14	36 32 42	34 57 56	33 22 58	31 47 46	30 12 22	28 36 46	27 0 59
	24	25 25 0							
Spica ♍	24	79 18 19	77 40 39	76 2 37	74 24 13	72 45 28	71 6 20	69 26 50	67 46 57
	25	66 6 41	64 26 1	62 44 58	61 3 31	59 21 41	57 39 27	55 56 49	54 13 48
	26	52 30 23	50 46 34	49 2 22	47 17 47	45 32 49	43 47 28	42 1 46	40 15 44
	27	38 29 22	36 42 38	34 55 38	33 8 23	31 20 53	29 33 11	27 45 19	25 57 18
	28	24 9 10							
Antares.	28	69 42 6	67 51 29	66 0 30	64 9 13	62 17 38	60 25 45	58 33 36	56 41 13
	29	54 48 34	52 55 42	51 2 38	49 9 24	47 16 0	45 22 27	43 28 48	41 35 4
	30	39 41 15	37 47 22	35 53 31	33 59 42	32 5 54	30 12 12	28 18 38	26 25 13
	M. 1.	24 31 59							

Distances of Moon's centre from Sun, and from Stars west of her.

Stars' Names.	Days.	*Noon.*			IIIh.			VIh.			IXh.			*Midnight.*			XVh.			XVIIIh.			XXIh.		
		D.	M.	S.	D.	M.	S.	D.	M.	S.	D.	M.	S.	D.	M.	S.	D.	M.	S.	D.	M.	S.	D.	M.	S.
Regulus.	1	37	39	5	39	31	57	41	25	2	43	18	18	45	11	43	47	5	17	48	58	55	50	52	39
	2	52	46	27	54	40	16	56	34	3	58	27	50	60	21	35	62	15	16	64	8	50	66	2	18
	3	67	55	40	69	48	52	71	41	52	73	34	41	75	27	19	77	19	42	79	11	51	81	3	45
	4	82	55	21																					
Spica ♍	4	29	2	42	30	52	39	32	42	27	34	32	4	36	21	28	38	10	40	39	59	35	41	48	15
	5	43	36	38	45	24	41	47	12	23	48	59	46	50	46	48	52	33	27	54	19	44	56	5	39
	6	57	51	11	59	36	19	61	21	4	63	5	25	64	49	22	66	32	56	68	16	5	69	58	50
	7	71	41	11																					
Antares.	7	25	49	54	27	31	17	29	12	22	30	53	7	32	33	34	34	13	41	35	53	29	37	32	58
	8	39	12	7	40	50	55	42	29	23	44	7	32	45	45	21	47	22	50	49	0	1	50	36	53
	9	52	13	26	53	49	40	55	25	37	57	1	16	58	36	38	60	11	43	61	46	32	63	21	5
	10	64	55	22	66	29	23	68	3	10	69	36	43	71	10	1	72	43	5	74	15	57	75	48	36
	11	77	21	2	78	53	16	80	25	18	81	57	10	83	28	50	85	0	19	86	31	39	88	2	50
	12	89	33	50	91	4	41	92	35	24	94	5	58	95	36	24									
α Aquilæ.	12	-	-	-	-	-	-	-	-	-	-	-	-	54	26	8	55	32	30	56	39	29	57	47	5
	13	58	55	14	60	3	56	61	13	5	62	22	41	63	32	44	64	43	8	65	53	53	67	4	56
	14	68	16	20	69	27	59	70	39	54	71	52	2	73	4	22									

Distances of Moon's centre from Sun, and from Stars west of her.

Stars' Names.	Days.	*Noon.*	IIIh.	VIh.	IXh.	*Midnight.*	XVh.	XVIIIh.	XXIh.
		D. M. S.	D. M. S.	D. M. S.	D. M. S.	D. M. S.	D. M. S.	D. M. S.	D. M. S.
The Sun.	19	- - -	- - -	- - -	- - -	- - -	- - -	39 37 31	41 0 9
	20	42 22 54	43 45 47	45 8 50	46 32 1	47 55 21	49 18 50	50 42 30	52 6 19
	21	53 30 19	54 54 30	56 18 52	57 43 27	59 8 13	60 33 11	61 58 23	63 23 49
	22	64 49 28	66 15 22	67 41 30	69 7 54	70 34 34	72 1 29	73 28 42	74 56 12
	23	76 23 59	77 52 4	79 20 28	80 49 11	82 18 13	83 47 34	85 17 15	86 47 18
	24	88 17 40	89 48 25	91 19 31	92 51 1	94 22 52	95 55 6	97 27 44	99 0 46
	25	100 34 11	102 8 1	103 42 15	105 16 54	106 51 58	108 27 27	110 3 20	111 39 40
	26	113 16 24	114 53 34	116 31 10	118 9 12	119 47 39			
Pollux.	24	11 36 58	13 13 14	14 50 7	16 27 38	18 5 44	19 44 24	21 23 36	23 3 19
	25	24 43 33	26 24 12	28 5 19	29 46 53	31 28 55	33 11 23	34 54 18	36 37 40
	26	38 21 29	40 5 44	41 50 26	43 35 34	45 21 8	47 7 8	48 53 34	50 40 26
	27	52 27 43	54 15 25	56 3 32	57 52 3	59 40 58	61 30 16	63 19 57	65 10 0
	28	67 0 25							
Regulus.	28	30 58 17	32 47 47	34 37 44	36 28 7	38 18 54	40 10 5	42 1 36	43 53 27
	29	45 45 38	47 38 5	49 30 48	51 23 45	53 16 55	55 10 17	57 3 48	58 57 29
	30	60 51 17	62 45 12	64 39 11	66 33 12	68 27 18	70 21 24	72 15 29	74 9 33
	M. 1.	76 3 33							

APRIL, 1817. II.

Days of the Week.	Days of the Month.	THE SUN'S Longitude. S. D. M. S.	Right Ascen. *in Time.* H. M. S.	Declination *North.* D. M. S.	Equation of Time. *Add.* M. S.	Diff. S.
Tu.	1	0 11 24 30	0 41 56.8	4 31 3	4 1.2	18.4
W.	2	0 12 23 33	0 45 35.0	4 54 8	3 42.8	18.3
Th.	3	0 13 22 34	0 49 13.2	5 17 7	3 24.5	18.0
F.	4	0 14 21 33	0 52 51.6	5 40 2	3 6.5	18.0
Sa.	5	0 15 20 30	0 56 30.2	6 2 50	2 48.5	17.7
Sun.	6	0 16 19 26	1 0 9.0	6 25 33	2 30.8	17.5
M.	7	0 17 18 19	1 3 48.0	6 48 9	2 13.3	17.2
Tu.	8	0 18 17 11	1 7 27.3	7 10 38	1 56.1	17.1
W.	9	0 19 16 2	1 11 6.8	7 33 0	1 39.0	16.7
Th.	10	0 20 14 51	1 14 46.5	7 55 14	1 22.3	16.4
F.	11	0 21 13 38	1 18 26.6	8 17 21	1 5.9	16.2
Sa.	12	0 22 12 23	1 22 7.0	8 39 20	0 49.7	15.8
Sun.	13	0 23 11 6	1 25 47.7	9 1 9	0 33.9	15.5
M.	14	0 24 9 48	1 29 28.7	9 22 51	0 18.4	15.1
Tu.	15	0 25 8 28	1 33 10.0	9 44 22	0 3.3	14.8
					Sub.	
W.	16	0 26 7 6	1 36 51.8	10 5 44	0 11.5	14.4
Th.	17	0 27 5 43	1 40 33.9	10 26 57	0 25.9	14.1
F.	18	0 28 4 17	1 44 16.4	10 47 59	0 40.0	13.6
Sa.	19	0 29 2 49	1 47 59.2	11 8 50	0 53.6	13.3
Sun.	20	1 0 1 19	1 51 42.5	11 29 30	1 6.9	12.8
M.	21	1 0 59 47	1 55 26.1	11 49 59	1 19.7	12.5
Tu.	22	1 1 58 13	1 59 10.2	12 10 16	1 32.2	11.9
W.	23	1 2 56 37	2 2 54.8	12 30 21	1 44.1	11.6
Th.	24	1 3 54 59	2 6 39.7	12 50 14	1 55.7	11.1
F.	25	1 4 53 18	2 10 25.2	13 9 54	2 6.8	10.7
Sa.	26	1 5 51 36	2 14 11.0	13 29 21	2 17.5	10.1
Sun.	27	1 6 49 51	2 17 57.4	13 48 34	2 27.6	9.7
M.	28	1 7 48 4	2 21 44.3	14 7 34	2 37.3	9.2
Tu.	29	1 8 46 16	2 25 31.6	14 26 20	2 46.5	8.7
W.	30	1 9 44 25	2 29 19.4	14 44 52	2 55.2	8.2
May	1	1 10 42 32	2 33 7.8	15 3 9	3 3.4	

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